American Machinist

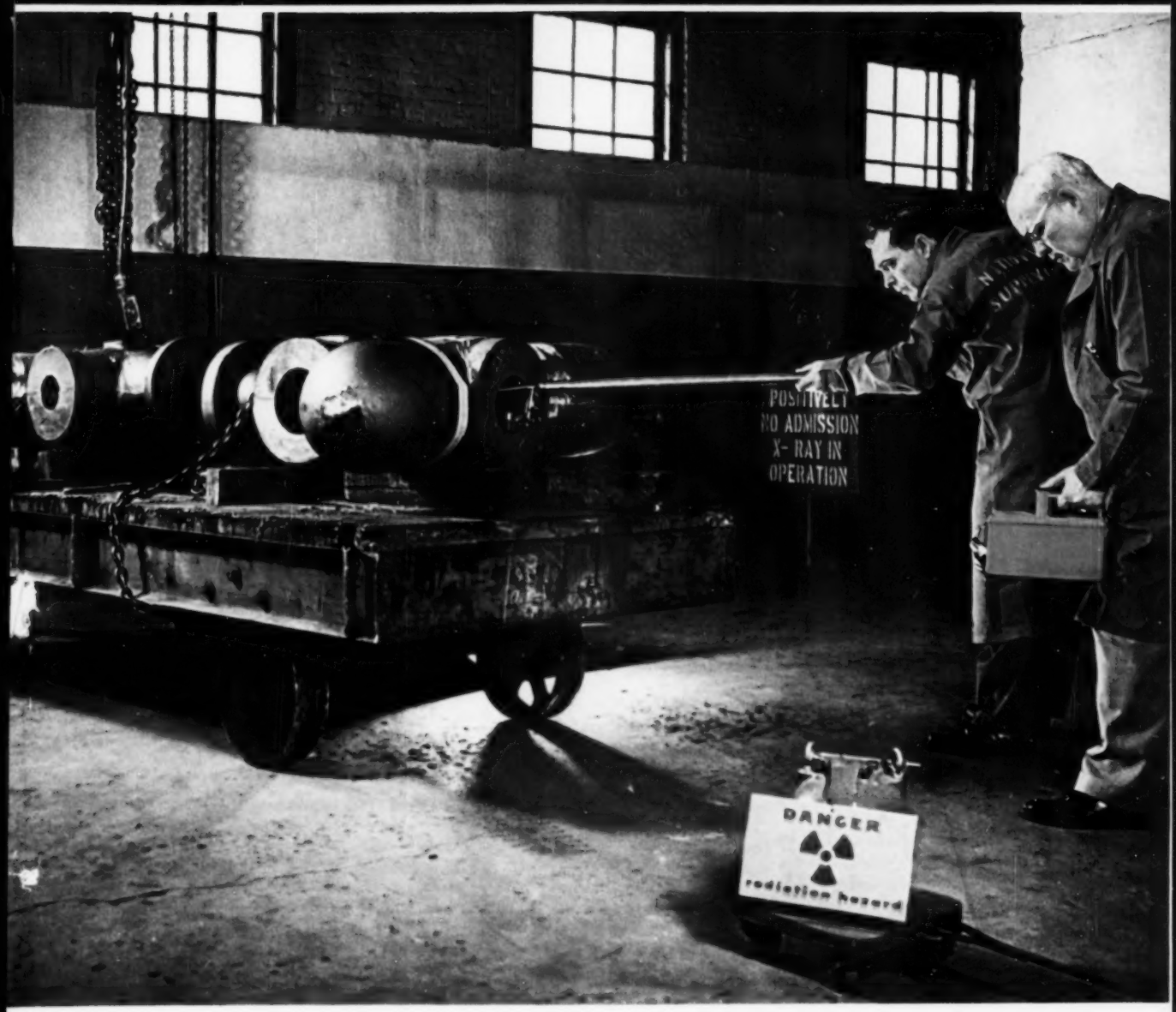
MAY 4, 1959 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

What Is High-Quality

CAST IRON?

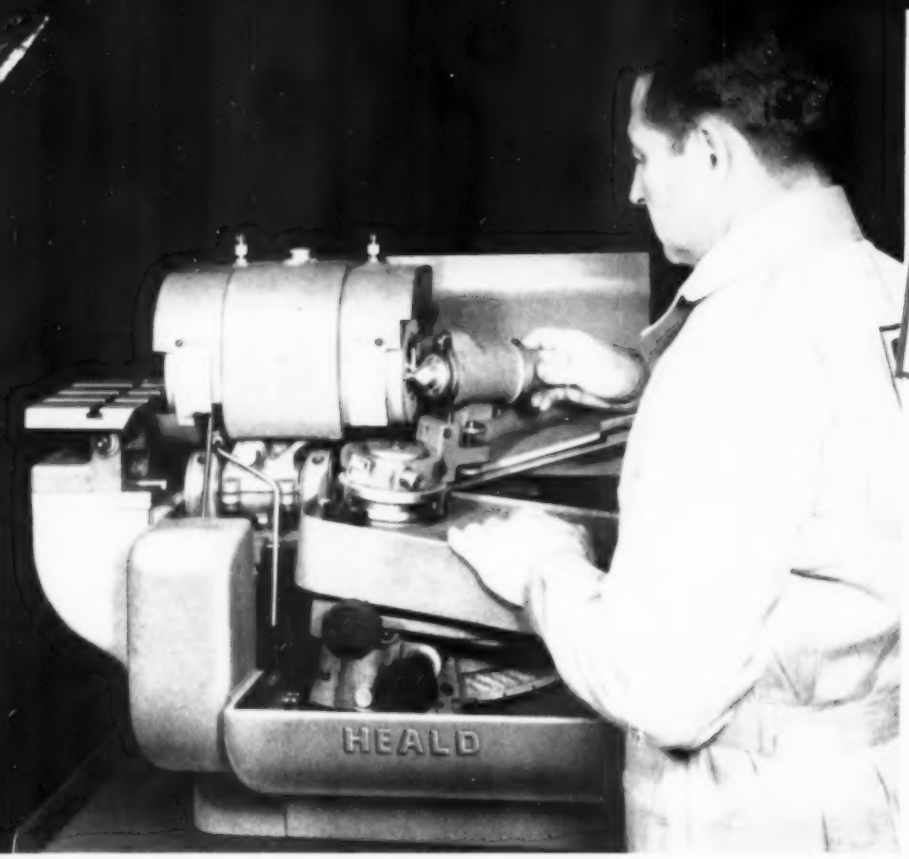
see page 104



Inspecting a pump housing with Cobalt 60 — see page 91

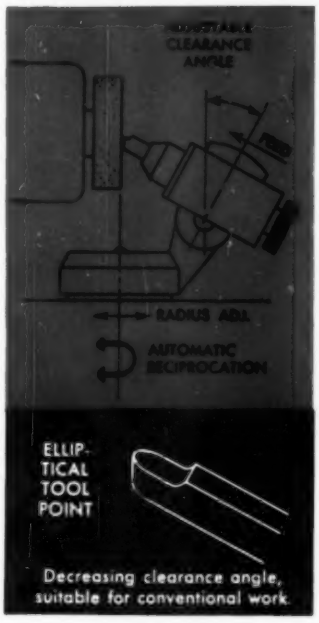
- **Cut all threads at high-speed,** page 87
- **11 steps to cutting-tool efficiency,** page 98
- **Tripled speed with magnesium die casting,** page 108

METALWORKING REPORT, page 2



Another
NEW
PRODUCT
by Heald

☐ File for Reference
☑ Send for Bulletin



New Model 4 TOOL SHARPENING MACHINE

provides highest precision and economy for both **TRUE RADIUS** and **ELLIPTICAL POINT** tool grinding

SETTING new standards of accuracy and economy, the new Heald Model 4 Tool Sharpening Machine is available for both *true-radius* and conventional *elliptical-point* tool grinding. The True Radius arrangement provides a constant tip radius and constant clearance angle, permitting greater accuracy where the point of contact with the tool varies with the configuration of the workpiece, as in contoured shapes. Where such tool geometry is of no advantage, the Model 3 Tool Sharpening Machine, capable of grinding elliptical point tools only, offers desirable savings in initial cost.

With either model, you get *fully automatic tool reciprocation* providing uniform and repetitive tool tip accuracy which permits one operator to tend several machines at the *same time*. An occasional adjustment of the feed knob (as in photo above) is the only operator attention needed. Offhand grinding attachment at left end of machine is standard equipment, furnished at no extra cost.

Remember — in metal cutting, it's the precision of the *tool tip* that guarantees precision results. Ask your Heald representative for complete information on this new Model 4 Tool Sharpening Machine, or send for Bulletin 243, Issue 1.

It PAYS to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

McGRAW-HILL

METALWORKING PRODUCTION

TRENDS

Metalworking Report . . 2
Spot News . . 69
Washington . . 71
Detroit . . 73
Aircraft and Missiles . . 75
Machine Tools . . 77
Materials . . 79
What's Ahead . . 81
Field Report . . 162

Departments...

Letters . . 62
Calendar . . 65
Editorial . . 85
Talking Shop . . 125
Memos . . 125
Practical Ideas . . 126
New Equipment . . 129
Names . . 193
New Books . . 202
New Films . . 204

contents for May 4, 1959

VOLUME 103, NO. 9

Cut all threads by "rapid threading" . . . At Watervliet Arsenal, the goal is high-speed threading for all production work. A vertical machine and a new attachment supplement standard rapid threading lathes. *By Richard T Berg.* . . **87**

Tool engineers talk cost-cutting . . . ASTE's Annual Meeting Stresses "Planning for Profit" **90**

Applied radiation performs for metalworking . . . A roundup of recent developments, proven techniques, and possibilities for the future. *By Charles Emerson.* **91**

Controls boost machine-tool output. **93**

Magnetic chucks are versatile work holders . . . They're being applied to lots of non-grinding jobs today. **94**

JIC hydraulic standards overhauled. **96**

Welding finds new uses, new techniques. **97**

11 steps to better cutting-tool performance . . . Here are the basic elements of success or failure. *By Frank J Sherman, H B Maynard & Co.* **98**

Aircraft subcontractor goes into airframes . . . Adapt, improve, refurbish were the keys at Rohr Aircraft. *By George H DeGroat.* **101**

Numerical control chops spindle-turning time . . . Card programming beats tracing by 30 to 85%. *By L P Armovich, Sundstrand Machine Tool Co.* **102**

What is "high-quality" cast iron? . . . Here is a valuable analysis of how foundry and user can work together to get high quality when it is needed. *By John Obrebski, Monarch Machine Tool Co.* **104**

Switch to Mag triples die-casting speed . . . Parts for small motors are now die cast from magnesium instead of aluminum. *By Hassel DePree, Westinghouse Electric Corp.* **108**

Line assembly turns out mowers . . . Shop shots at Porter-Cable's Yard Master plant. **110**

At France's Renault it's "vive l'automation" . . . A detailed report on current production methods in a plant where production costs have been progressively reduced. **112**

REFERENCE BOOK SHEETS

Application of carbide boring bits, I, II . . . Speed, feed, and tool angle data for solid carbide boring bits. *By Paul Neiderfringer, Atrax Co.* **119**

Application of carbide end mills . . . Speeds, feeds, and rules for use of carbide end mills. *By Carl Neiderfringer, The Atrax Co.* **123**

TURN PAGE FOR METALWORKING REPORT →

METALWORKING REPORT

SIGNIFICANT CURRENT DEVELOPMENTS IN TOOLING AND PRODUCTION PROCESSES

CUTTING

Faster, Better Threading

Automatic threading with single-point tools has been adopted as a general principle—and goal—at Watervliet Arsenal. All production threading operations will be converted to this method as soon as possible.

The program aimed at this goal started with Cri-Dan rapid-threading lathes, but these could handle only the small and medium parts. Larger parts called for a new approach. As a result, an 800-lb breech ring is now being rapid-threaded vertically on a Bullard Man-au-trol, probably the first vertical application of the technique.

Another development is a Watervliet-designed attachment that will convert most lathes to rapid threading without tying up the machine—without making a "special" out of it, see p87.

Chem-Mill Stainless

The process of chemical milling, originally applied to the light metals, is being extended to steels and superalloys. United States Chemical Milling Corp, Manhattan Beach, Calif, claims to be successful in cutting 300- and 400-series stainless, precipitation-hardening stainless, and high nickel alloys as well as more conventional carbon and mild alloy steels. Less success has been obtained with cobalt alloys.

In addition, word comes from Detroit that stainless wheel disks are being milled by chemical means.

Crush Dress Extension

Crush dressing of grinding wheels with a carbide-hardened steel roll, widely used for thread and form grinding, may be extended to the redressing of grooves in the rolls for roll mills by the steel industry.

The average life of a "pass" in these rolls is 8 hr for a chilled cast iron roll of 70 to 72 Shore hardness. In the new method developed by Sheffield Corp, rolls of 84 to 86 Shore hardness can be ground with 8 passes at once. Present method is to refinish rolls by turning in a lathe, and 32 passes in an average roll require 3 to 4½ hr. Crush-dress grinding took 70 min in a recent demonstration.

Each pass was 0.217 in. wide by 0.075 in. deep with a 0.116 in. radius at the bottom. Tolerance on width and depth was held to 0.0015 in. Spacing from pass to pass was held to ±0.00025 in. with accumulated pitch error of 8 passes less than ±0.001 in.

FORMING

Meters Die-Casting Shots

Automatic ladling applied to the cold-chamber process speeds production of magnesium die castings. The process costs less to maintain than hot-chamber (gooseneck) method.

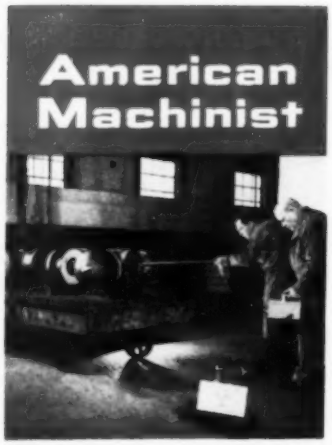
Westinghouse's Small Motor Div has equipped each die-casting machine with a special metering device. Molten magnesium flows from a gas-fired holding pot to an air-actuated valve. At the proper point in the automatic cycle, the valve opens and closes, thereby injecting a measured charge into the shot well of the die casting machine.

The plunger mechanism for the hot-chamber process would cost about $1500. A breakdown involves lengthy, costly repairs. "Wear parts" of the cold-chamber setup cost only $100, are quickly replaced.

Magnesium die casts about three times as fast as aluminum; die life is about the same. Die faces are more easily cleaned when magnesium is die cast. They are cleaned daily with muriatic acid and an inhibitor to remove magnesium oxide. Chemical cleaning is simpler than the die polishing needed for aluminum. For details see page 108.

CAUTION

These pages are not a synopsis of this issue of American Machinist. Major articles are described briefly in the Contents page. Because the Trends pages are classified by subject, they are not described anywhere else. Most of the developments in this department are so new that further information is not yet available —when it is, you will find a page reference to the article.



COVER:

Cobalt 60 radiographic element is placed inside a slush pump to produce X-ray pictures that show metal structure. Inspection technique is applied by National Supply Co, Toledo, to check weld quality. Scintillation counter held by second operator indicates radiation level, see page 91.

Computer Synthesizes Roll Flowing

Wider use of roll-flowing processes is hampered by the time-consuming cut-and-try tool development necessary for many complex shapes. So many variables must be resolved that the tooling cost for short runs, or the lead time, becomes impractical—unless the parts are essential and cannot be produced to the same quality by any other method.

Scientists at the Missiles Systems Div of Lockheed Aircraft Corp (Van Nuys, Calif) are developing mathematical techniques to sharply reduce the process development time. In effect they convert, by internally storing a program as in the APT System (AM—Mar 9 '59, p106), a computer into a synthetic roll-flowing machine. Then, all of the variables such as speed, pressure, part geometry, physical characteristics of the material, etc, are used to construct a mathematical (prediction) model as a computer program.

THE OUTLOOK

Metalworking operations are within 10 points of peacetime high of 182 on American Machinist Index and promise to stay there or go higher. Auto, appliance and farm implement people are especially active, with capital goods output also rising. Details on p101.

HEAT TREATING

Superalloy Heat Treatment

Recent investigations at Ryan Aeronautical Co's metallurgical laboratories show that Rene 41, General Electric's high-strength, heat and oxidation-resistant superalloy, develops its tremendous strength through a two-stage precipitation-hardening process. The material is first heated to 1975 F for 30 to 60 minutes, air cooled, and then reheated to 1650 F for four hours. The first treatment is a re-solution process, the second is an aging process. Rene 41, like many other superalloys, will work harden and thus require annealing. This can be done by heating the metal to 1975 F for 30 minutes, and then quenching quickly in oil or water. Oil is preferred because it minimizes distortion.

Quenching must be completed in two seconds to obtain ductility. Air-cooled material has a hardness of 30 R_c and an elongation of 31% in two inches; quick-quenched material has a hardness of 23 R_c or less and an elongation of 45%.

INSPECTION

Radiography Without Film

The Naval Bureau of Ships has come up with a shortcut radiographic method that inspects ship welds from one side only and gives an immediate answer—no X-ray film.

A source of gamma rays (cobalt 60) is moved along the weld line with a radiation detector to work something like radar. Geiger counters, cadmium sulphide, and selenide crystals were tried as detectors, but scintillators worked best. The weld itself acts as a back scatter.

J I Bujes, US Naval Ordnance Test Station, states in an AWS paper that the "resolution" of the method is now 4%. That is, it can detect a void of 0.040 in. in a 1-in.-thick weld.

One inch is the present maximum, but the Bureau aims at thicker welds and better resolution. The method has not yet seen actual use, but, in theory, it can inspect 1000 ft of 1-in.-thick weld in 11 hrs, see p91.

WELDING

Ultrasonics Welds Packages

Collaboration between Alcoa and Aeroprojects has produced a low-power ultrasonic seam welder suitable for air-tight aluminum-foil packaging.

At present the two companies are jointly demonstrating a prototype 100-watt unit that welds 0.001-in.-thick sheets of half-hard aluminum at speeds up to 35 fpm. It can handle thicknesses up to 0.005 in., but at slower speeds. A larger unit—2000 watt—has joined 0.006-in. sheets at 50 fpm.

Ultrasonic energy is delivered to the work continuously by the upper roller. The lower roller supports the work. Pressure-tight welds are made in aluminum and a variety of other metals, similar and dissimilar. Degreasing is usually the only surface preparation.

Arc Welding Glass and Ceramics

A new magnetic-arc method, developed by Corning Glass Works for welding glass and ceramic articles, can handle a much wider range of materials and temperatures than previous glass-welding methods.

"The magnetic-arc machines are capable of heating and melting or volatilizing accurately controlled portions of any refractory, glass, or ceramic body, regardless of its electrical or thermal properties," says E. G. Guyer of Corning in an AWS paper.

As conventional metal-welding arcs do not work with dielectric materials, the operation calls for high-voltage electric arcs travelling in properly oriented magnetic fields, over suitable arc-runners encircling the parts to be joined.

ASSEMBLY

Dip Makes High-Strength Braze

Aluminum assemblies are now dip-brazed for strength that approaches that for fusion welding. R. O. Roberts Co., Whittier, Calif., reports that fillet joints are 80% as strong as welded fillets, and that dip-brazed butt joints are 20% stronger than welded joints. These are results after three years of experience with dip brazing, which is a simple, inexpensive process.

After a predetermined amount of brazing alloy is added to the assembly, it is preheated to around 1000 F, then immersed slowly in an Ajax salt-bath furnace held at 1080-1120 F. The braze stock flows as it heats, avoiding contamination because atmosphere is excluded. Immersion time is 45 sec to 2 min. Assembly is quenched in water.

Some success with magnesium FS-1 alloy indicates that dip brazing for magnesium assemblies may soon become practical commercially. The company has developed a practical method for protecting the surface of the metal after brazing.

French Automation; C'est Bon

Renault Dauphines are assembled by equipment that it is claimed by Renault, and admitted by a Ford executive, to be more mechanized than any in this country. Among outstanding operations: A steering-box assembly machine that feeds parts and locates them, then packs in grease and adds a cover plate is more advanced than machines here; Magnetic blankholders at punch presses drop sheet-metal parts into baskets that tip them onto conveyors; A double-sided welding machine spot-welds rain gutters to door frames, both left and right.

Renault also builds its own machine tools, including building-block units; and is now completing a connecting-rod transfer machine for its competition—Peugeot. See p112.

FINISHING

Soft-Chrome Plating

Chromium electrodeposits which are softer and more ductile than those normally produced are obtainable with a new process developed by Metal & Thermit Corp, New York City. Hardness is only 500 to 700 Knoop, as against the usual 800 to 1000, and deposits, which may be 0.0003 to 0.0004 in. thick, are dense and free from cracks.

Deposition rate is about the same as in conventional plating, but temperature requires control to within ± 1 F.

Ordinary chrome plate is normally permeated by hairline cracks and requires a substantial undercoat of nickel and/or copper for optimum

METALWORKING REPORT . . .

corrosion resistance. Cracks become apparent at thicknesses above about 0.0001 in., and coatings of this thickness are often also porous. Porosity may be reduced by increasing the thickness, but this increases cracking. With soft chrome, however, deposits may be made directly on steel with excellent corrosion resistance, and may even be quenched from 900 F without any evidence of cracking.

A notable feature of the chromic-acid - based electrolyte is its pronounced levelling characteristic, which means that the surface finish improves as the thickness increases. Parts which, as machined, had a 30 to 50 mu-in. finish have been improved to 7 mu in. by a 0.0003 to 0.0004-in. deposit. Zinc die casting plated by the process are given a light gray matt finish similar to a good as-cast bloom and may then be brought to a high lustre by light buffing.

MATERIALS HANDLING

6000 Packages an Hour

It's possible to package up to 6000 small metal parts an hour with a machine developed by Product Packaging Engineering of Culver City, Calif. The automatic packager, known as Pax-Mor, makes its own plastic bags, prints them, feeds in the parts to be packaged, cuts bags apart, even rejects empty bags. The dust- and moisture-proof bags are sealed on all four sides.

The machine, which can make packages as large as 8 in. square, needs only one operator to feed parts into a revolving table. If the parts are really small, a vibrating trough, filled up by the operator, feeds the parts automatically.

Packaging medium can be practically any coated or laminated heat-sealable material, like polyethylene-coated kraft paper or cellophane. The machine will hold 700-yd-long rolls of this material.

The unit was recently installed at the Airesearch Mfg Div of the Garrett Corp in Phoenix, Ariz.

MATERIALS & COMPONENTS

Transparent VPI Wrapping

Metal parts now can be wrapped for shipping or storage in a vapor-phase inhibiting (or vapor-corrosion inhibiting) material which is transparent. Called "Nox-Rust Clear-Pak," the transparent material is tough DuPont Mylar treated by the manufacturer, Daubert Chemical Co, Chicago to permit heat-sealing. This quality is said to be unusual in that Mylar has not formerly been considered heat sealable.

Typical conditions for sealing the film are a bar temperature of 300 F, a dwell time of 0.5 sec and a pressure of 5 psi of bar surface. Material is supplied in a standard thickness of 0.0015 in. and in rolls 900 ft long by 12 in. wide. Nox-Rust Clear-Pak is designed to protect iron and steel. However, its use with cadmium, copper, lead and zinc showed only slight staining after two months exposure at 76 F and 80% relative humidity.

High-Strength Alloy 0.010 In. Thick

Using the Sendzimer mill at its wrought alloy plant, Haynes Stellite Co is rolling 0.010-in.-thick sheets of Haynes Alloy No. 25 in widths up to 36 in. Thus thin, high-strength, lightweight segments of the alloy are available for missile and honeycomb sections.

Reduced by cold rolling, this alloy has unusually high stress-rupture strength in the temperature range of 1500 to 2000 F. When coupled with an aging heat treatment, cold rolling can increase yield strength to 180,000 psi. And even at this higher strength, the alloy can be formed.

MANUFACTURING CONTROL

New JIC Hydraulic Standards

More than three out of every four hydraulic standards set up in 1953 were changed at a recent 3-day Joint Industries Conference. Meeting was attended by nearly 150 builders and users of hydraulic equipment who acted upon recommendations submitted by a committee of users.

Changes include adoption of ASA standard graphical symbols in standard hydraulic diagrams; new standards for welded steel tubing; new safety standards; and changes in standards for hydraulic controls, pumps, piping, and fittings.

The new standards reflect advances in machine-tool design, as well as increased use of hydraulics in automation. For details, see the report on p90.

ALBERT HAUPTLI publisher

BURNHAM FINNEY editor

ANDERSON ASHBURN managing editor

RUPERT LE GRAND senior associate editor
WM M STOCKER, JR senior associate editor
BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
GEORGE H DE GROAT Detroit editor
TOM JOHNSON associate editor

ANN McTAGUE assistant editor
GOSTA WERNBERG assistant editor
RICHARD T BERG assistant editor
JOHN J DWYER, JR assistant editor
ARTHUR J ROTH assistant editor

JOSEPH S POZNANSKI art director
MATTHEW T HAGGERTY assistant art director
ROSEMARIE KELLY makeup

ROBERT SHEETS news editor
MORTON REICHEK Washington
DONALD LOOMIS Washington
DONALD MacDONALD Detroit
WILLIAM G MELDRUM Cleveland
STEWART RAMSEY Chicago
MARGARET RALSTON San Francisco
JOHN KEARNEY Los Angeles
MICHAEL J MURPHY Los Angeles
RAY BLOOMBERG Seattle
B E BARNES Atlanta
KEMP ANDERSON, JR Dallas
WILLIAM J COUGHLIN London
ROBERT GIBSON Moscow
ROBERT E FARRELL Paris
PETER WEAVER Mexico City
MORRIE HELITZER Bonn
SOL SANDERS Tokyo
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept
GEORGE B BRYANT, JR chief Washington Bureau
JOHN WILHELM manager world news
FRED H COLVIN editor emeritus

GEORGE REPPERT, JR advertising sales manager
P F PRITCHARD manager, market research
JAMES J HOGAN business manager
ROBERT C MATTOON circulation manager
RAN SCLATER promotion manager
CATHERINE C KANE manager, reader service

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index. American Machinist publishes its own annual index; this is available on request to the editor.

A McGRAW-HILL PUBLICATION

American Machinist, published bi-weekly, with an additional issue in mid-September, by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), founder.

EXECUTIVE, EDITORIAL, CIRCULATION, ADVERTISING and PUBLISHING OFFICES: Mcgraw-Hill Building, 330 West 42nd st, New York 36, NY. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary. Officers of the Publication Division: Nelson Bond, President; Hoyt L. Waddell, Senior Vice President; Keith B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

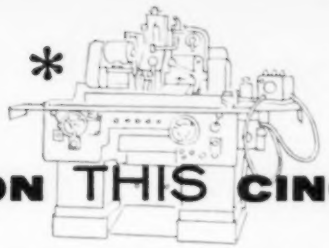
Postmaster: Please send form 3579 to American Machinist, 330 West 42nd St, New York 36, NY.

United States subscription rate for individuals in the field of the publication $5.00 per year, single copies 75 cents. Canada $7.00 per year. Foreign $25.00 per year, payable in advance. Second-class postage paid at New York, NY. Printed in USA. Title registered in U.S. Patent Office.

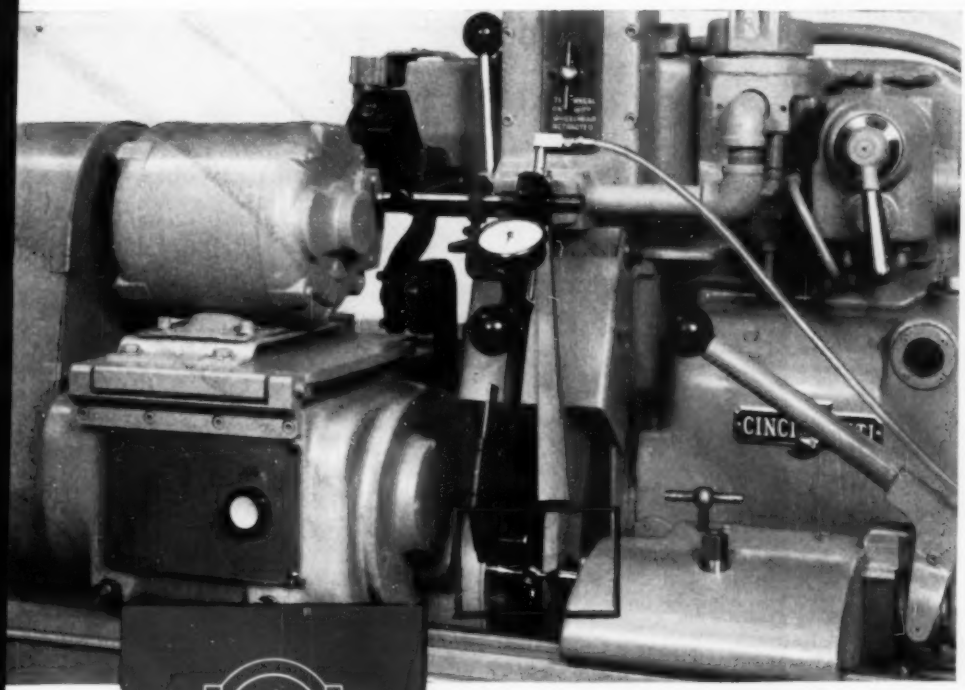
Copyright 1959 McGraw-Hill Publishing Co. Inc. all rights reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Fulfillment Manager, American Machinist, 330 West 42nd st, New York 36, NY. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

CINCINNATI

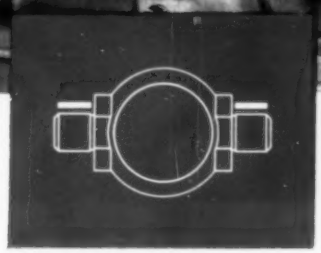


WORK GROUND ON THIS CINCINNATI IS ACCURATE WITHIN MILLIONTHS



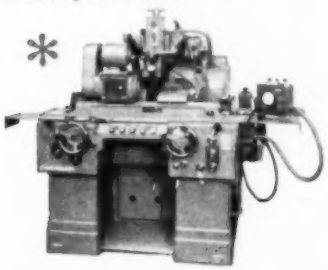
BEARING DIAMETERS on small super-accurate parts are ground to a roundness and size within millionths. A CINCINNATI FILMATIC 4" Plain Grinder is specially modified for this work.

FILMATIC



DRAWING OF SPIDER being ground in illustration above; heavy lines indicate ground diameters. Production, 50 per hour at 80% efficiency.

Below: **CINCINNATI FILMATIC 4" PLAIN HYDRAULIC GRINDER,** specially built and equipped to grind small parts at a low-cost production rate, and to master gage accuracies. Complete data in catalog No. G-551-5.



Accuracy begets accuracy. Cincinnati modified this 4" Plain Grinder, a fine machine in its standard attire, to obtain an amazing degree of repetitive accuracy on production work . . . **sizing and roundness are within millionths.**

Extra operations are performed in fitting and assembly. In addition, the footstock is of two-piece construction, with taper slide for zero alignment of the center. The coolant tank and pump are isolated from the machine, and incorporate a filtering unit. Exclusive FILMATIC spindle bearings are utilized in the headstock as well as in the grinding wheel spindle mounting. Other feature-advantages include super-accurate automatic air-electric gage sizing and hydraulic truing.

The exactness required in today's space aeronautics parts and other types of gages and equipment cannot be provided by conventional grinding machines, especially those over five years old. It takes a new CINCINNATI, with Cincinnati's long-time experience in creating accuracy that begets accuracy. The 4" Plain Grinder illustrated here and the larger Plain Grinders described on the following pages demonstrate just a few of many reasons why it pays to specify Cincinnati. We'll be glad to tell you more. **Grinding Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTRIC • ROLL • CHUCKING • CENTERLESS LAPPING

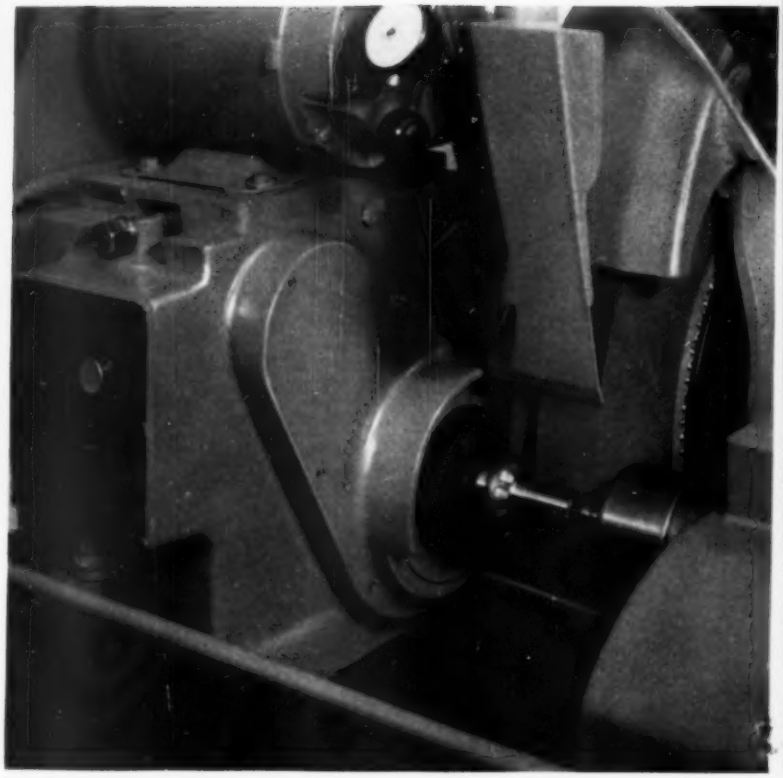
CINCINNATI

GRINDING MACHINE DIVISION

The HIGHEST

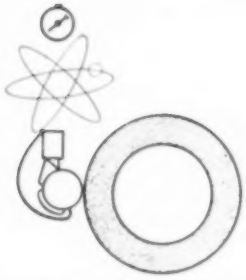
is ground on

LARGE DIAMETER SLEEVE GEARS and other expensive parts are precision ground with confidence on this CINCINNATI FILMATIC 10"R Plain Hydraulic Grinding Machine.

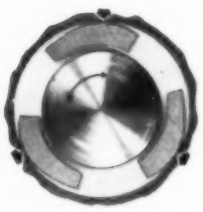


CINCINNATI FILMATIC 10"L PLAIN GRINDER incorporates complete automation in quality and production control for precision grinding three diameters on steel shaft end. Production rate: 125 parts per hour.

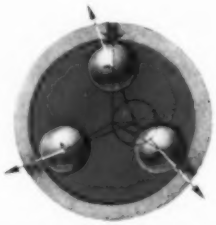
CINCINNATI



AUTOMATIC AIR-ELECTRIC GAGE SIZING with its exclusive Cycle Time Stabilizer provides consistently high quality of sizing and finish without hand adjustments.



FILMATIC GRINDING WHEEL SPINDLE BEARINGS, an exclusive Cincinnati feature, eliminate spindle flutter. Run for years without maintenance or adjustment.



FREELY ROTATING STEEL BALLS automatically balance the wheel mount assembly when unclamped. Perfect balance is attained in a few seconds.

BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTRIC

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CIRCLE 172 READER SERVICE CARD

QUALITY WORK

CINCINNATI FILMATIC Plain Hydraulic Grinders

Much of the craftsman's skill for producing extra high-quality work is incorporated in every CINCINNATI FILMATIC® Plain Hydraulic Grinding Machine. That's why even comparatively inexperienced operators can do an excellent job with a Cincinnati.

FILMATIC grinding wheel spindle bearings and automatic grinding wheel balancing are vital segments of this "built-in skill." These two exclusive features alone put Cincinnati grinders far ahead of the field, make them a first choice candidate to replace your productively obsolete machines. Other feature-advantages include anti-backlash device on the infeed screw, single lever control, automatic pickfeed infinitely variable from .0001" to .0025". Extra automatic equipment available for production work: air-electric gage sizing, push-button dual rate infeed, behind-the-wheel truing, gap eliminator, headstock drive plate positioning, and numerous additional items.

Information on the complete line of CINCINNATI FILMATIC Plain Hydraulic Grinding Machines will be found in the catalogs listed in the spec table. Write for copies, or ask Cincinnati's Grinding Specialists to assist you with your problems in quality and production.

CINCINNATI FILMATIC 10"R Plain Hydraulic Grinding Machine

There are four sizes in this line of fine precision grinding equipment:

Size	Between-Center Lengths	Catalog
6"R } 10"L }	18" and 30"	G-660-2
10"R } 14"L }	18", 36", 48" 72" and 96"	G-661-2

FILMATIC

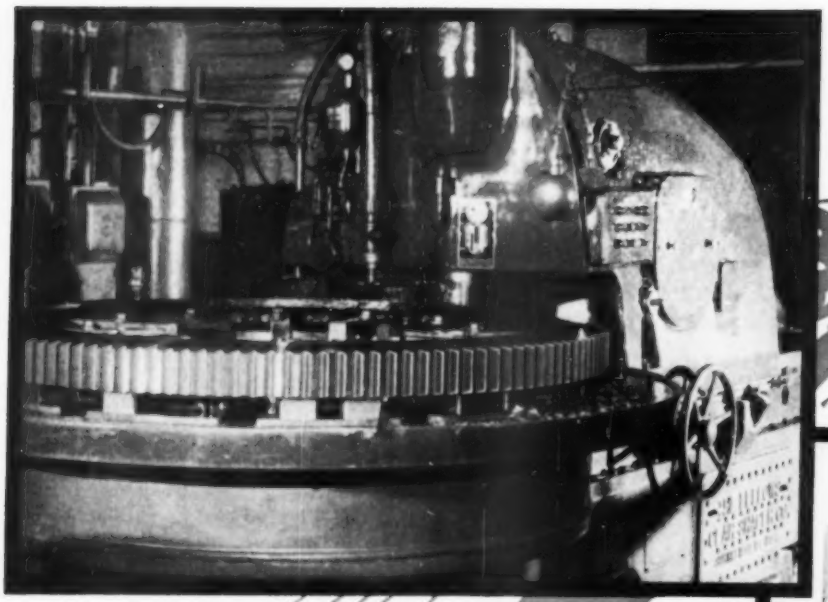
• ROLL • CHUCKING • CENTERLESS LAPPING

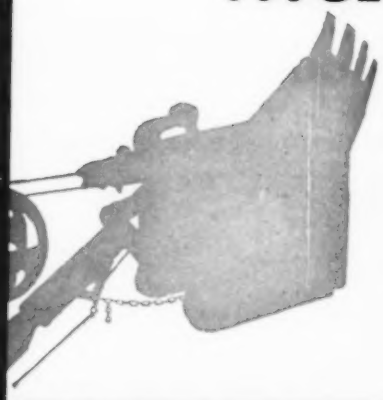
CINCINNATI®
GRINDING MACHINE DIVISION

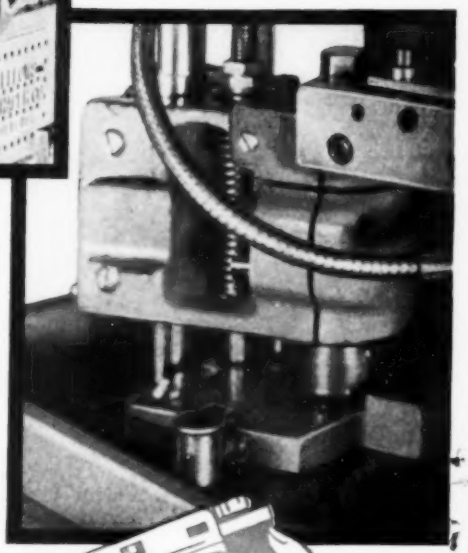
CIRCLE 173 READER SERVICE CARD

GEARS to Turn a Giant

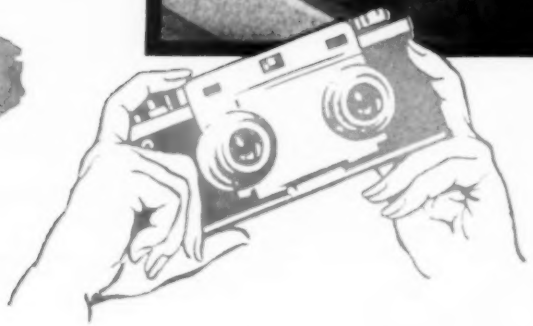
...or







● Follows 120° Gear Shaper cutting 138-tooth cast steel gear for a shovel-crane. Four cuts—1181 min. approx.



THE PRECISION LINE

Shovel
Adjust a Small Camera

For any size gear in the range, new Fellows Gear Shapers lower costs because of their versatility, fast set-up and production speed.

● Fellows 3" Fine-Pitch Gear Shaper cutting 27-tooth, 0.4219" P.D. steel camera gear. One cut—35 seconds, floor to floor.

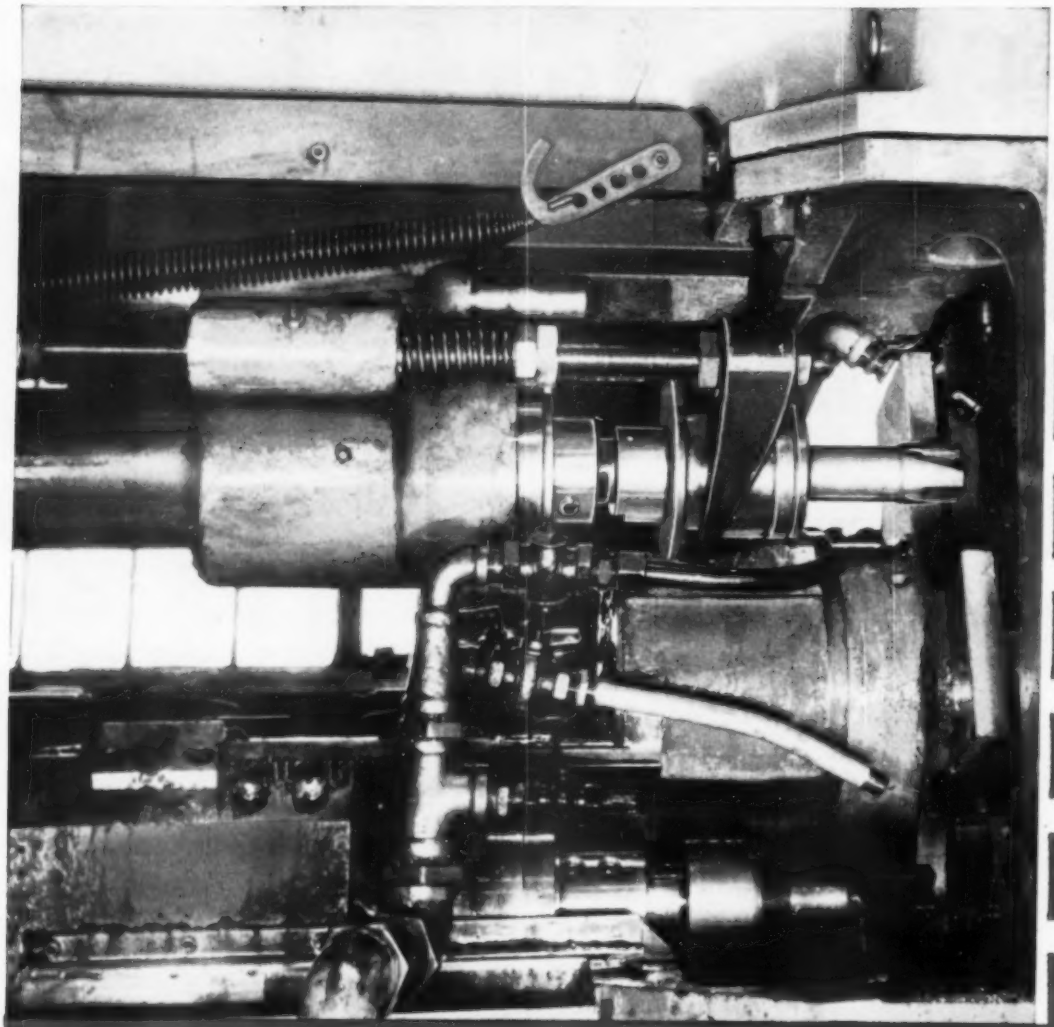
Whatever capacity you need, from 1/16" to 120" P.D. there's a Fellows Gear Shaper that will pay dividends in lowered production costs. In many plants, new Fellows machines have cut unit costs by more than a third and repaid the original investment in a very few years.

In every size range, new Gear Shapers speed set-ups and change-overs, increase production flexibility as well as cutting speeds and feeds. Rigid construction makes it possible to hold close tolerances on internal and external spurs, helicals and herringbones, as well as on an almost unlimited variety of cams, splines and other non-involute shapes.

Your Fellows Representative can *show* you in your plant where you can cut production costs with newer machines. Ask him today. Simply write, wire, or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

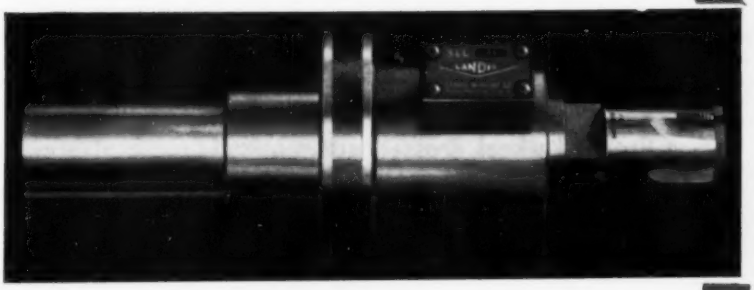
Fellows *Gear Production Equipment*



LANDIS TAP

for bar automatics...

3000 pieces between grinds at 140 SFM



A LANDIS, Rotary Style, Collapsible Tap is giving excellent chaser life producing taper threads during high-speed machining runs at the Grabler Manufacturing Co., Cleveland, Ohio.

The 2LL Tap, equipped with a 1½" extra long head; is shown installed in the right-hand third position on a New Britain Automatic machining 350 malleable iron union bodies per hour. Though threading at the high speed of 140 SFM, 3000 1½" 11½ pitch NPT threads are produced between chaser grinds.

LANDIS LL Receding Chaser Collapsible Taps, designed especially for taper threading, feature a receding action that contributes to excellent chaser life. A precision mechanism diametrically recedes the chasers during threading at a rate equal to the desired thread taper. This reduces cutting strains by restricting cutting action to the throat or chamfer section, and provides longer chaser life between grinds. An important additional feature of this receding action is the generation of a truly conical taper thread with no chaser leave off marks.

LL Taps can be furnished for rotary or stationary applications from 1⅜" to 20" in diameter . . . the 2LL illustrated here, using 5 different Tap Heads, will thread all pipe diameters from 1" to 2½". For more details, write for Bulletin G-95 . . . perhaps your plant has an internal taper problem that may be simplified by a LANDIS LL Collapsible Tap.

505C

LANDIS *Machine* COMPANY

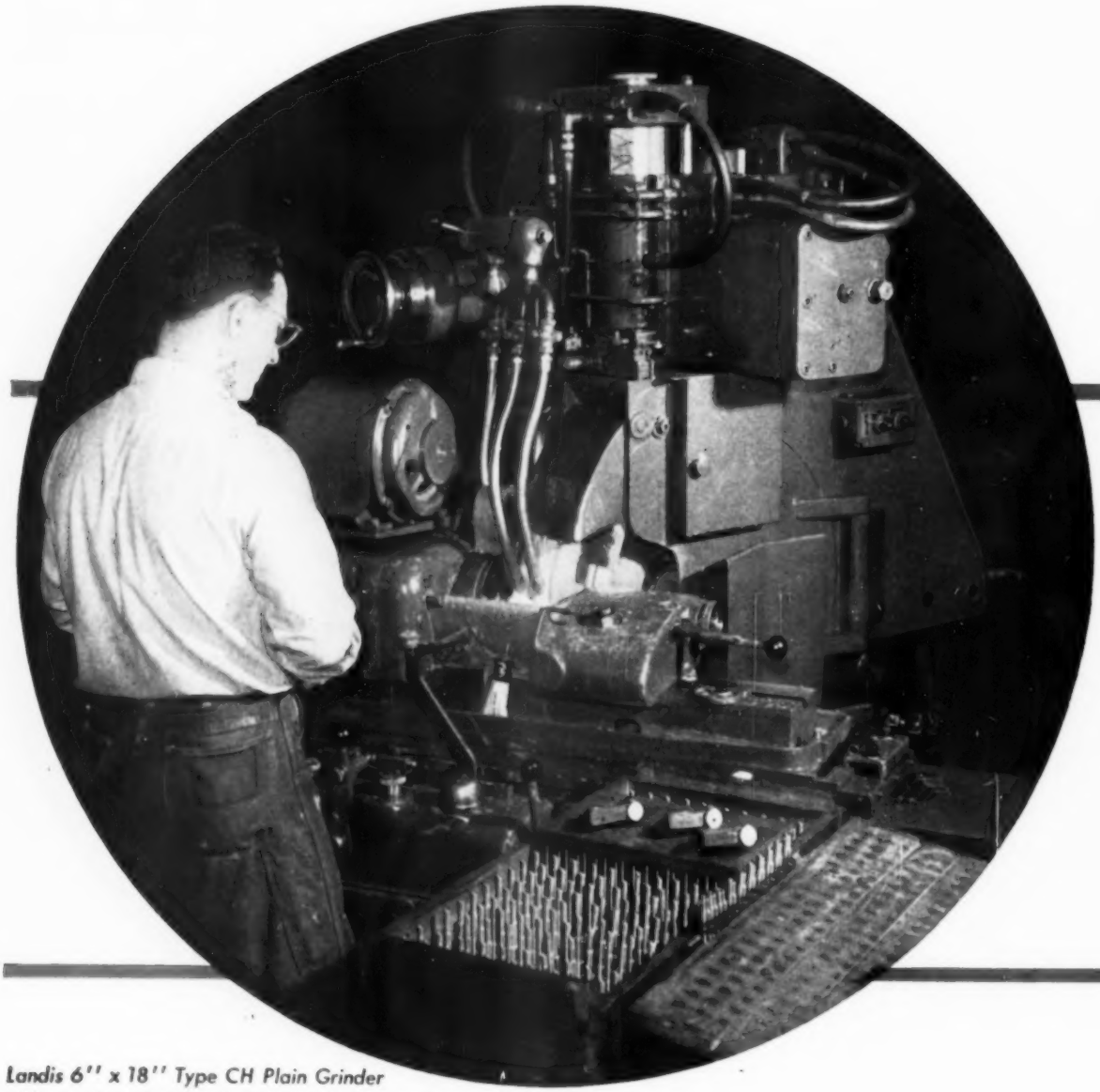
WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

Pump manufacturer cuts grinding cycle

. . . Landis grinder with angular wheel head grinds

- **One control starts work rotating, coolant flow, and advances wheel head**
- **Profiled wheel dressed automatically without breaking setup**
- **Grinds to a tolerance of .0003" on diameter**

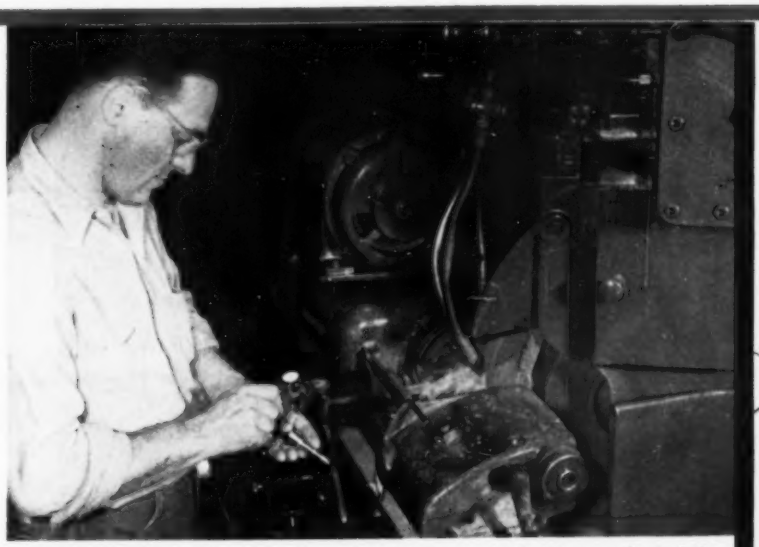


Landis 6" x 18" Type CH Plain Grinder with angular wheel head and overhead dresser

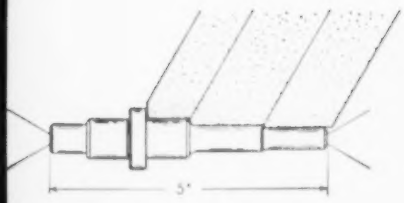
LANDIS TOOL COMPANY

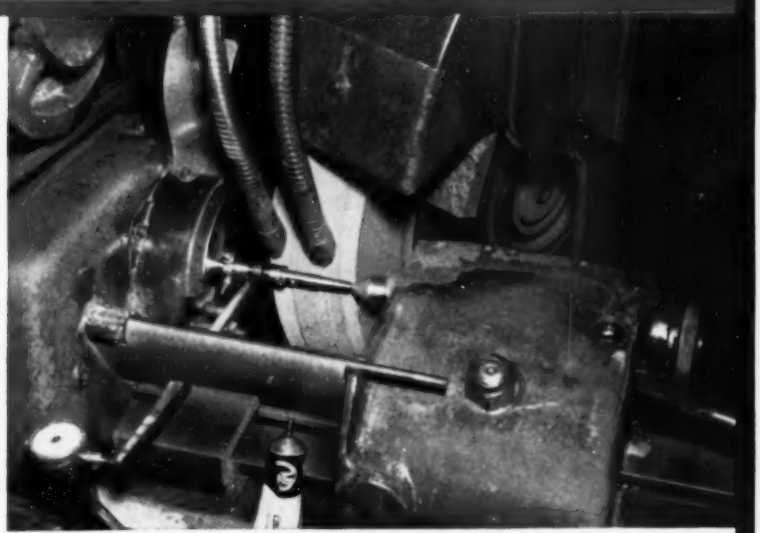
# of multi-diameter shaft by 80%

3 diameters and face in one operation



Spot checks of workpiece for size and finish made while another piece is being ground.





Lateral locator used to align the workpiece before advancing the wheel.

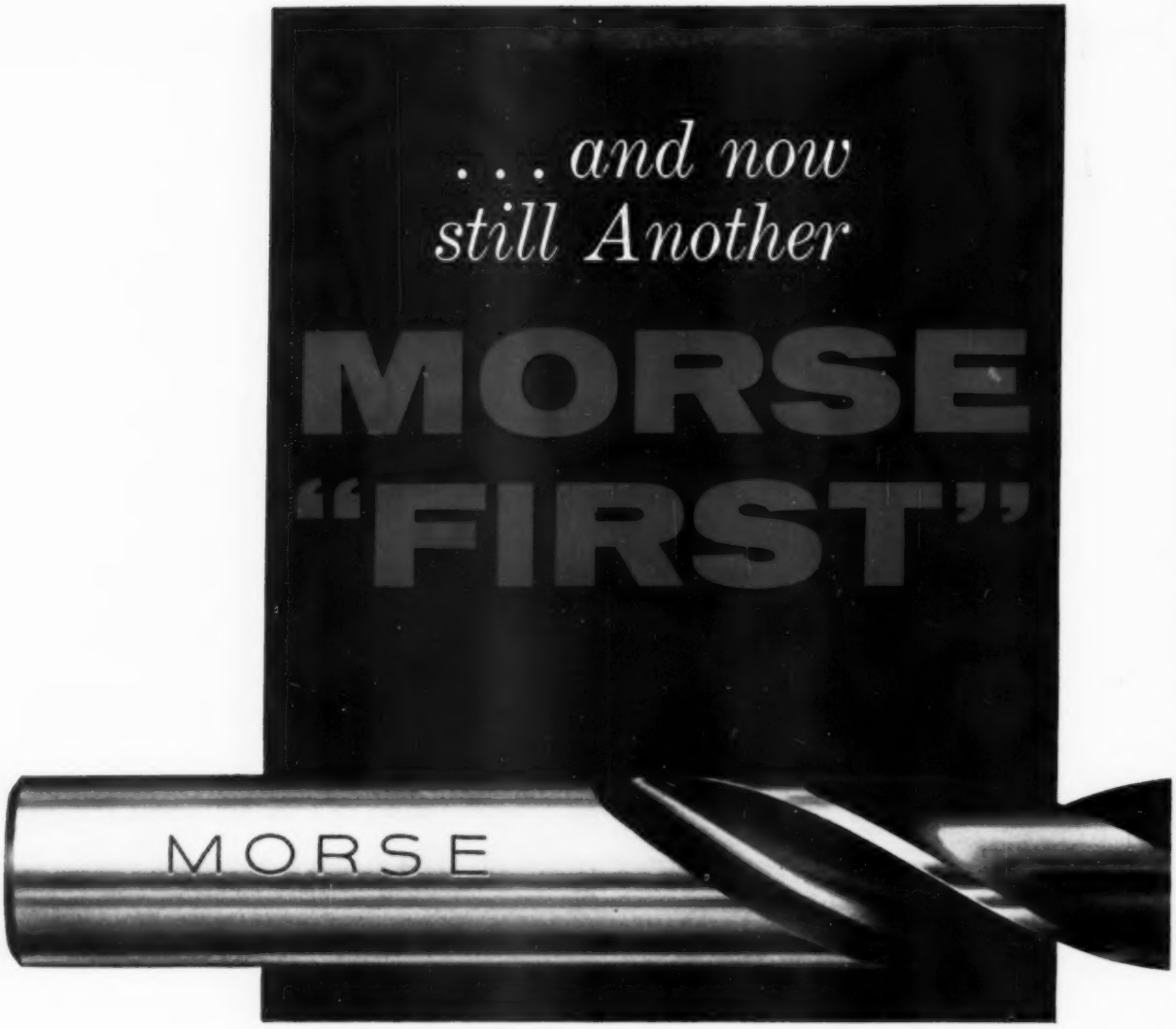
production data

Machine:	Landis 6''x 18''Type CH Plain Grinder with 30° angular wheel head
Part:	Multi-diameter pump shaft
Operation:	Infeed grinding 3 diameters and adjacent face at one time
Cycle time:	20-22 seconds, including handling
Material:	C-1144
Hardness:	65 Rockwell C
Stock removal:	.010''-.015''
Finish:	10-20 Micro-inch
Tolerance:	.0003'' on the bearing diameter

WAYNESBORO, PENNSYLVANIA

LANDIS

precision grinders



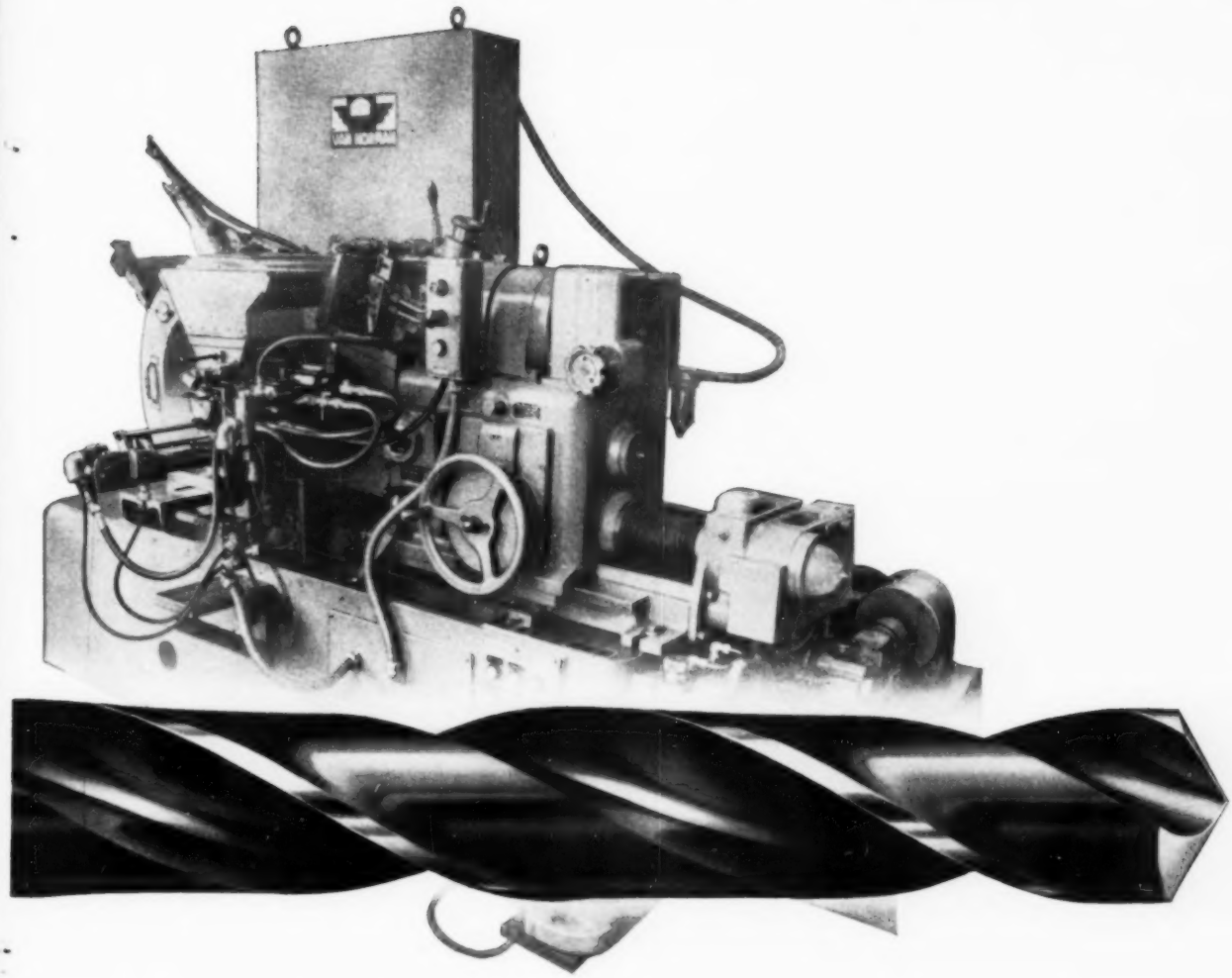
Quality Precision Grinding stepped VAN NORMAN Centerless Grinder

Ever since Stephen Morse produced the first twist drill, Morse has been the leader of progress in cutting-tool production methods.

Electrolizing . . . Vectormatic Taps . . . Morse's flute-grinding process . . . these are some of the Morse milestones in supplying better and better cutting tools to industry.

Now here's another step ahead . . . centerless grinding of drills on this new high-precision, high-production Van Norman Diversimatic machine, specially adapted to Morse requirements.

To *you*, this means *new high standards* of uniform quality and prompt delivery. See your Morse-Franchised Distributor *today*.



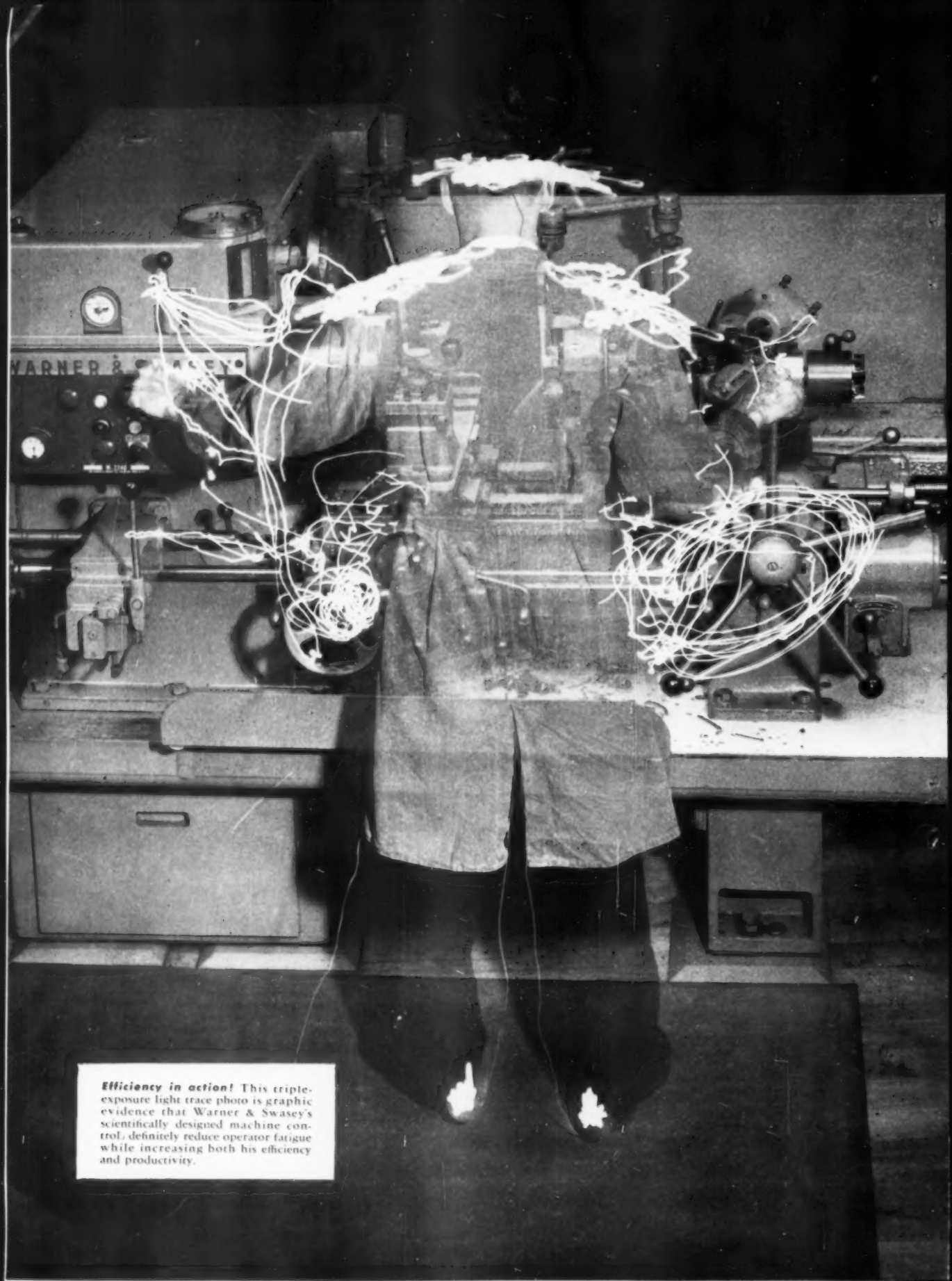
up with this NEW

MORSE *means*
"THE MOST" *in Cutting Tools*

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASS.

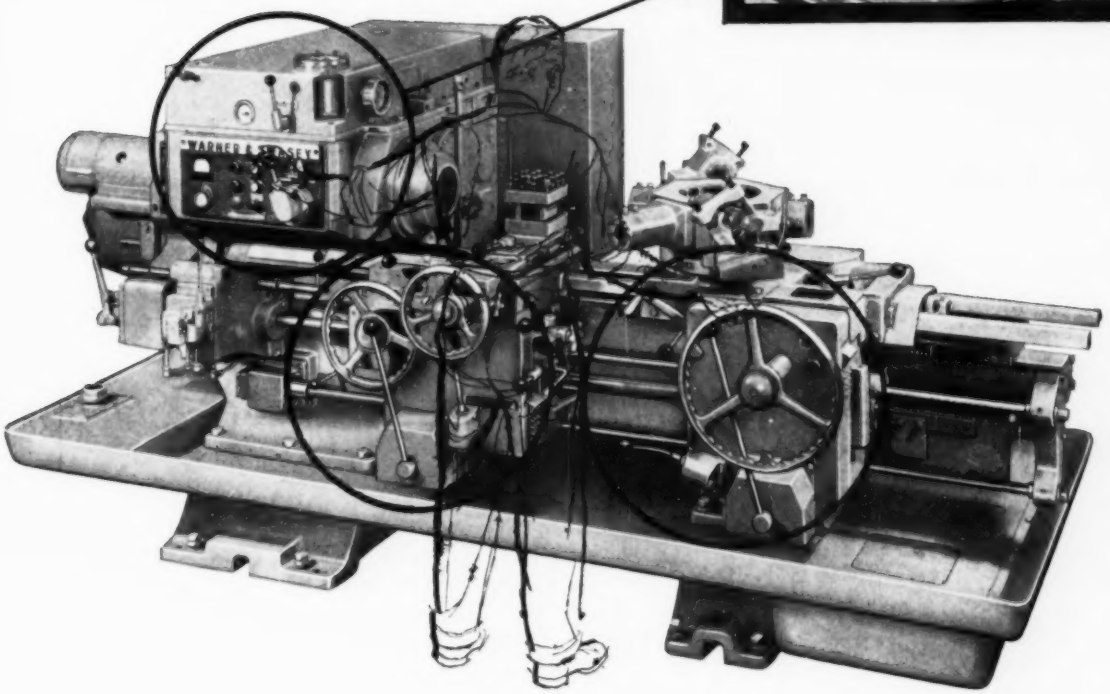
Warehouses in: New York • Chicago • Detroit • Dallas • San Francisco

VN Division of VAN NORMAN INDUSTRIES, INC.



Efficiency in action! This triple-exposure light trace photo is graphic evidence that Warner & Swasey's scientifically designed machine controls definitely reduce operator fatigue while increasing both his efficiency and productivity.

This exclusive Warner & Swasey Speed Preselector, heart of the "zoned controls" system, enables the operator to preselect the correct speed for each cut, with just a glance-and-a-twist of the knurled knob. Proper speeds are chosen for the required cuts on the job and then marked in sequence with numbered clips placed on the top of the chart drum. Just a touch of the lever instantly shifts the machine to the next desired speed.



Warner & Swasey Zoned Controls boost production by increasing operator efficiency

Known throughout industry as "the operator's machine", Warner & Swasey turret lathes are painstakingly designed with the human element in mind. They provide easy-to-handle operating controls, compactly arranged at convenient levels that minimize stooping and reaching — all of which contribute to increased operator satisfaction and higher production. Heart of the "zoned controls" system is Warner & Swasey's exclusive Speed Preselector — calibrated in surface feet and spindle RPM's versus work diameters — that encourages operator use of the proper spindle speeds for the particular job being machined. Additional single lever control features praised by operators include: A fast, simple change for spindle speeds; apron feed levers with "feel" control; four-way carriage rapid traverse; easy operating turret units and hydraulic collet chuck and bar feed control. For more detailed information about the adaptability of Warner & Swasey turret lathes to your particular machining problems, call in our Field Representative, today.

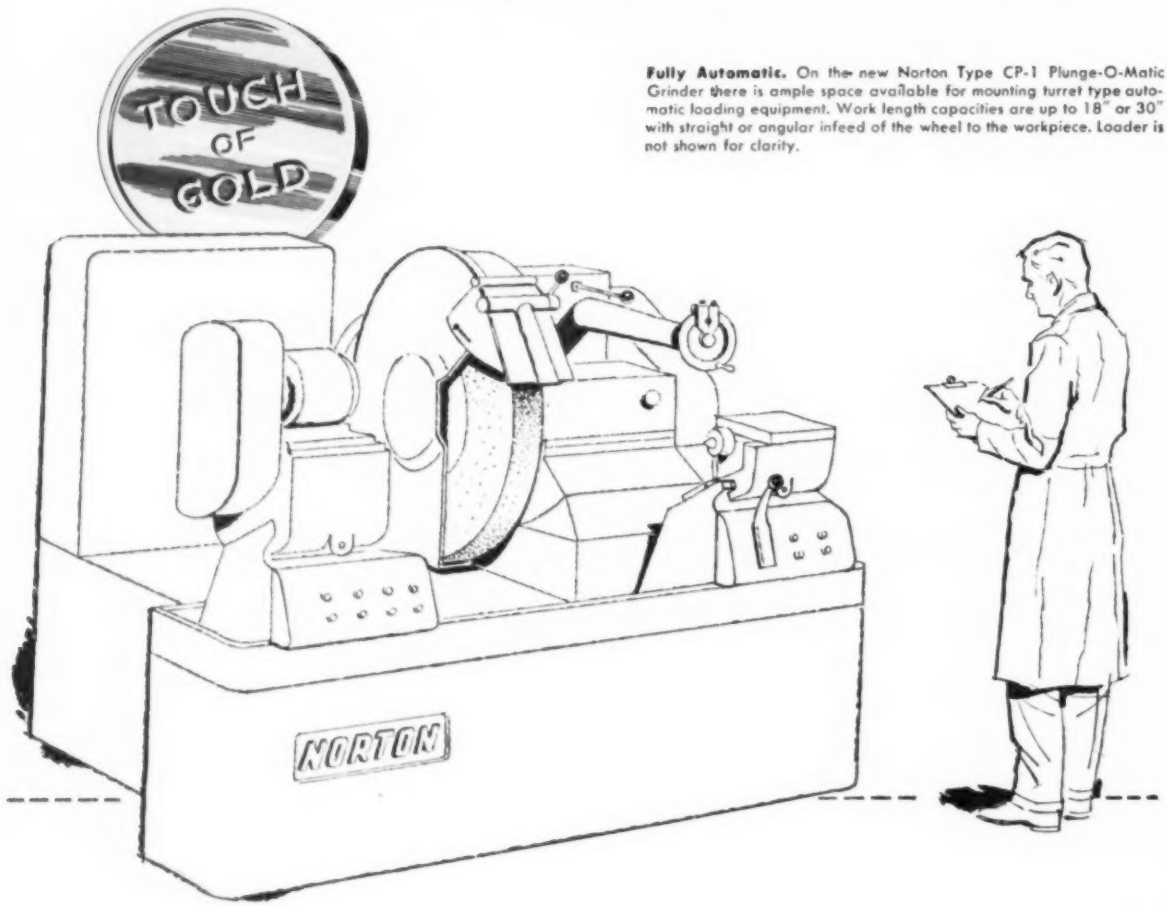
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

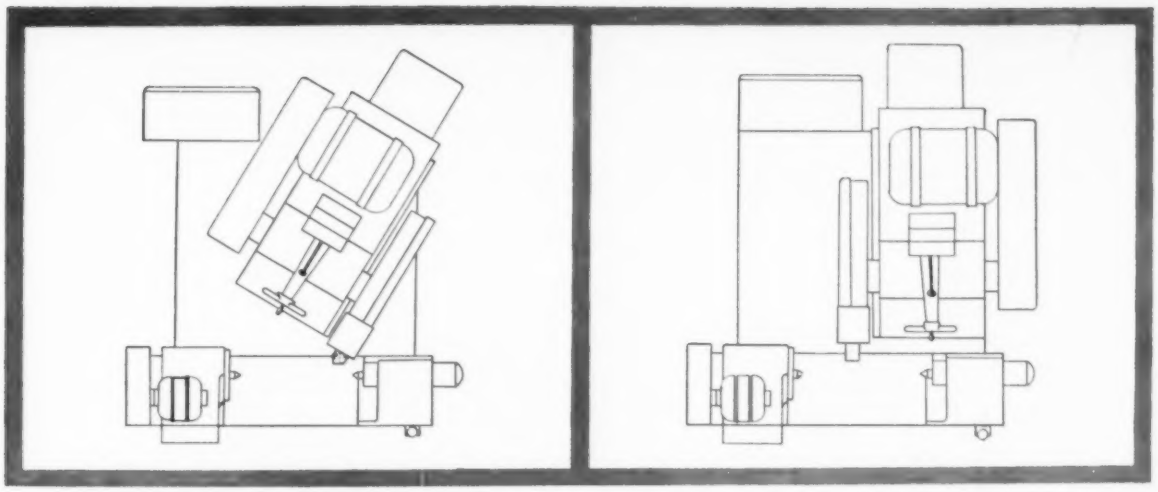
CIRCLE 183 READER SERVICE CARD

Built for one big purpose!

New Norton Plunge-O-Matic* Grinder simplifies



Fully Automatic. On the new Norton Type CP-1 Plunge-O-Matic Grinder there is ample space available for mounting turret type automatic loading equipment. Work length capacities are up to 18" or 30" with straight or angular infeed of the wheel to the workpiece. Loader is not shown for clarity.



Versatility of design allows positioning the wheelhead as required for the job. Those shown are only two of many possible variations.

automatic loading for mass production grinding

In design, the Norton Type CP-1 Plunge-O-Matic Grinder is brand new. While retaining outstanding proven features of Norton cylindrical grinders — and co-ordinating them with a new turret type loader for fast, automatic plunge grinding — it has no unnecessary mechanism.

As traverse grinding is not involved, swivel and sliding tables, hydraulic table cylinder and attendant control valving have been eliminated. Taper adjustments are made in the automatic truing device located in the wheelhead. The base contains no inner mechanism, its sole function is to rigidly support the headstock, footstock, wheel slide and loader.

This machine provides for automatic loading — a new departure from the usual cylindrical grinder design. On the Plunge-O-Matic Grinder the gap in front of the grinding wheel is 19" deep by 18" or 30" work length — ample space to accommodate the new turret loader. And since one type of loader can handle many parts, only the loader insert, which actually holds the parts, needs specific designing. This reduces the original cost and operating maintenance of automatic loading.

The Plunge-O-Matic wheel slide, unitized and entirely independent, carries grinding wheels of 30" or 36" diameter and can be located as desired on the base. Complete flexibility for angular grinds is assured, and heavy duty grinding with wide or multiple wheels can be provided for.

Your Norton Sales Engineer, a trained specialist in grinding, will be glad to give you more facts about the Plunge-O-Matic Grinder — with an accurate estimate of how much you can save. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada.* J. H. Ryder Machinery Co., Ltd., Toronto 5.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

NORTON

GRINDERS *and* LAPPERS

Making better products
to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

for management

The experienced investor examines his portfolio of securities frequently, buying or selling to adjust to changing conditions and improve his earnings.

The metalworking executive is an investor, too, responsible for constantly checking his investment in machine tools. He knows that shrinking returns on outmoded equipment can squeeze him right out of competition.

If you are currently surveying your "portfolio" of machine tools, it will pay you to consider an investment in Avey production equipment, which in many cases has earned its acquisition price in less than two years. Avey Division, The Motch & Merryweather Machinery Co., Box 1264, Cincinnati 1, Ohio

Standard machine price equals

for production men

The flexibility of "standard" equipment and the production of "special" are combined in this 62-foot Avey Line-O-Dex machine.

Operations on the jet engine diffuser case include drilling, countersinking, reaming, and lead screw tapping.

One fixture moves both linearly and radially to index the part. Add a second fixture and you double production.

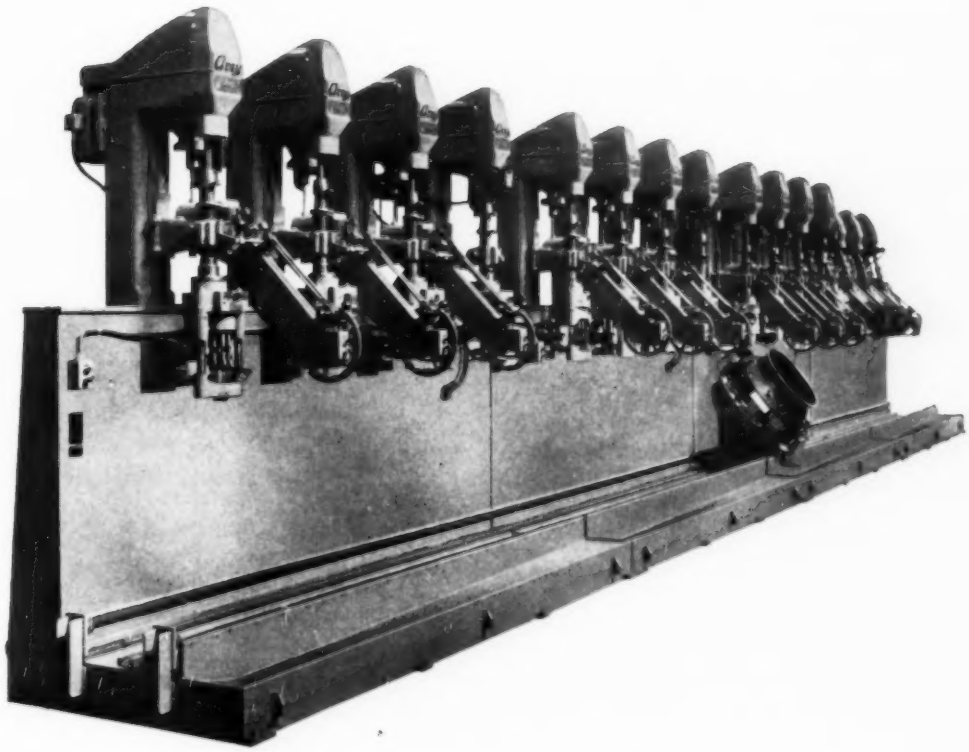
Standard drilling columns are arranged with multiple spindle drill heads which have power feed, four rates of feed, adjustable speeds, and additional head and quill travel to permit easy changeover to a new design.

Transfer mechanism is supported by the base. Another example of Avey's customer-oriented engineering.

Avey

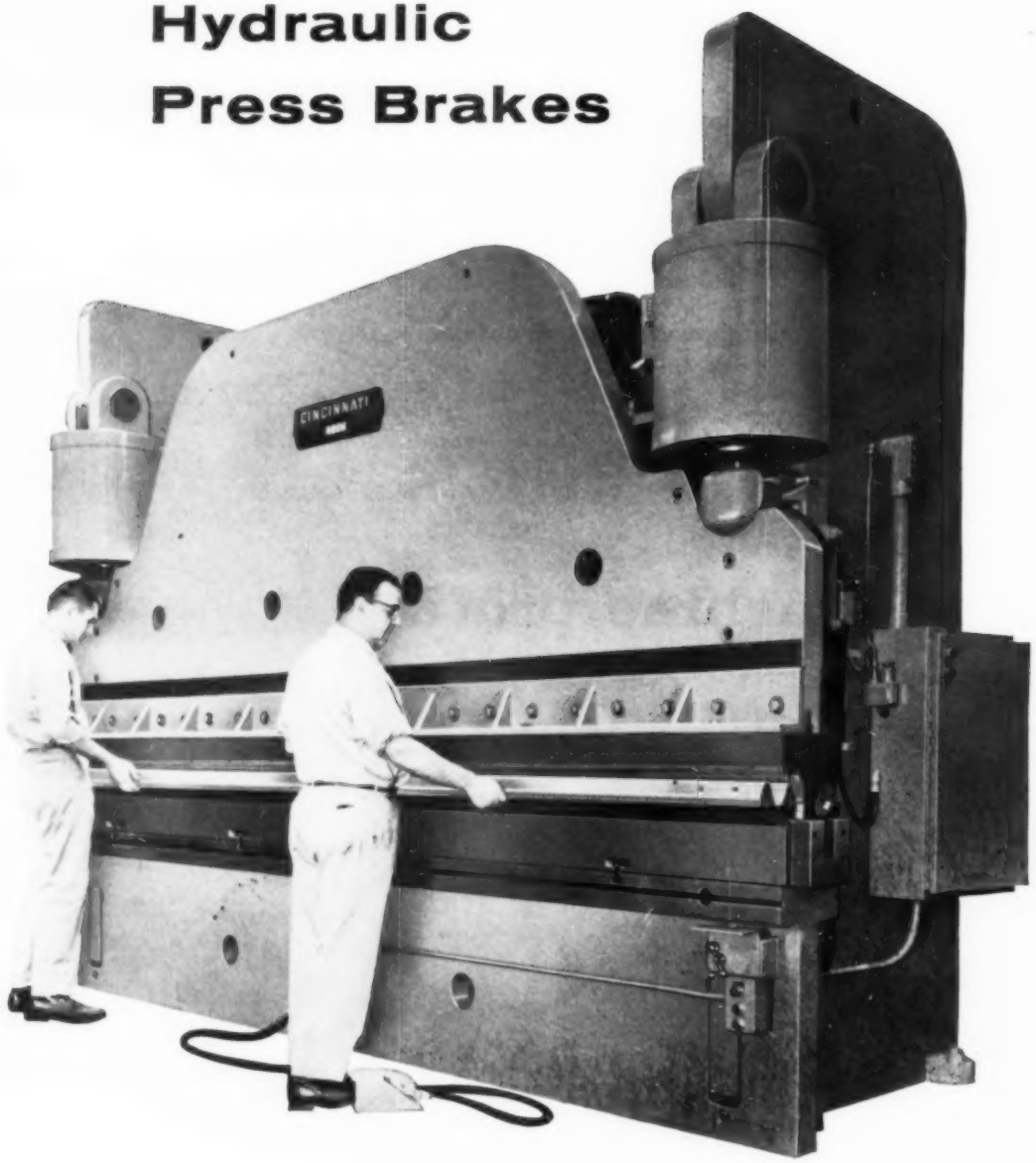
drilling, tapping, production machines

special machine profit



American Machinist • May 4, 1959 CIRCLE 187 READER SERVICE CARD 21

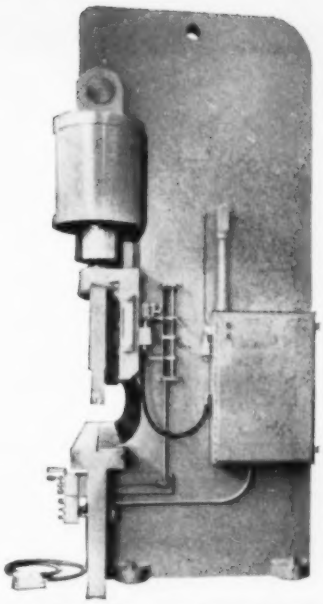
3 basic advantages of CINCINNATI® Hydraulic Press Brakes



Cincinnati® Hydraulic Press Brakes, now available in 300, 400, 500, and 600 ton capacities, are not substitutes for Cincinnati® Mechanical Press Brakes. Where high production, maximum accuracy, and greatly increased tonnage at the bottom of the stroke are required, Cincinnati Mechanical Press Brakes remain unchallenged. However, where accuracy requirements are not extremely critical, where high speed is not necessary and where long strokes are desirable, Cincinnati Hydraulic Press Brakes offer important advantages—some entirely new to the field of hydraulic press brakes.

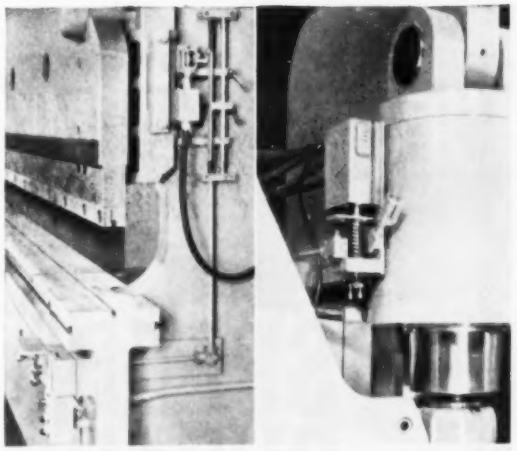
1 Accuracy

A special Cincinnati feature is extra heavy housings which extend above the cylinders, providing a means for their unique clevis mounting. This gives true center-line loading: vertical thrust of the cylinders is carried by the housings *without welds or bolts*. The cylinders are connected to the ram with ball joints and are self-aligning in all directions. Binding of pistons and ram slides cannot occur. In addition, deep beds and rams, and large radii at all stress points minimize deflection and insure maximum accuracy. With Cincinnati interlocked construction, the bed is supported directly by the housings *without* load bearing welds.



2 Convenience

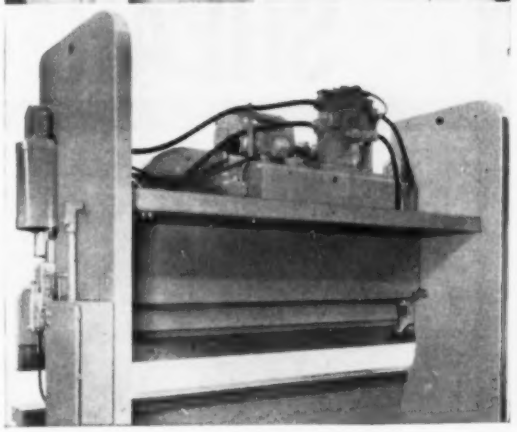
All controls are at right end of the machine, within easy reach of the operator. The bottom stroke-stop adjusting crank is on the front of the bed. Micrometer registers are provided to indicate both the bottom stroke-stop and ram tilt adjustments, a great convenience in setting dies on initial or repeat setups. Tonnage, stroke length, and ram position are easily set. Indicator lights tell direction ram is moving or ready to move. Machine cannot overload: it reverses when loaded to any given tonnage setting.



3 Economy

Greatly simplified maintenance and reduced cost result from Cincinnati's exclusive hydraulic manifold block, which brings valves and piping together in one compact assembly. The usual maze of valves, pipes and fittings is eliminated. High pressure joints are reduced to a minimum, which means important maintenance economies, year after year.

Write Dept. A for informative Bulletin HB-1.



Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO. Cincinnati 11, Ohio, U.S.A.

put the small jobs
on a
Lodge & Shipley

24" SPEED SHEAR

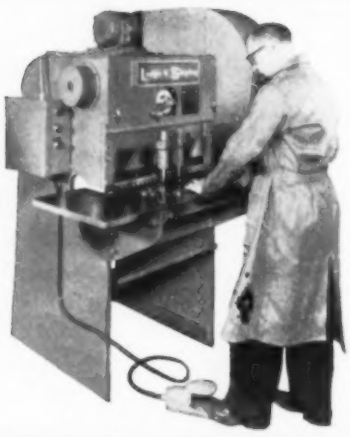
"Match the job to the equipment" . . . a simple rule for doing it faster and at lower cost . . . means you also free heavy duty shears for the jobs they do so well!

Particularly designed for fast cutting of small pieces, up to 1/8" x 24" mild steel, the Lodge & Shipley 24" Speed Shear is production proved for . . .

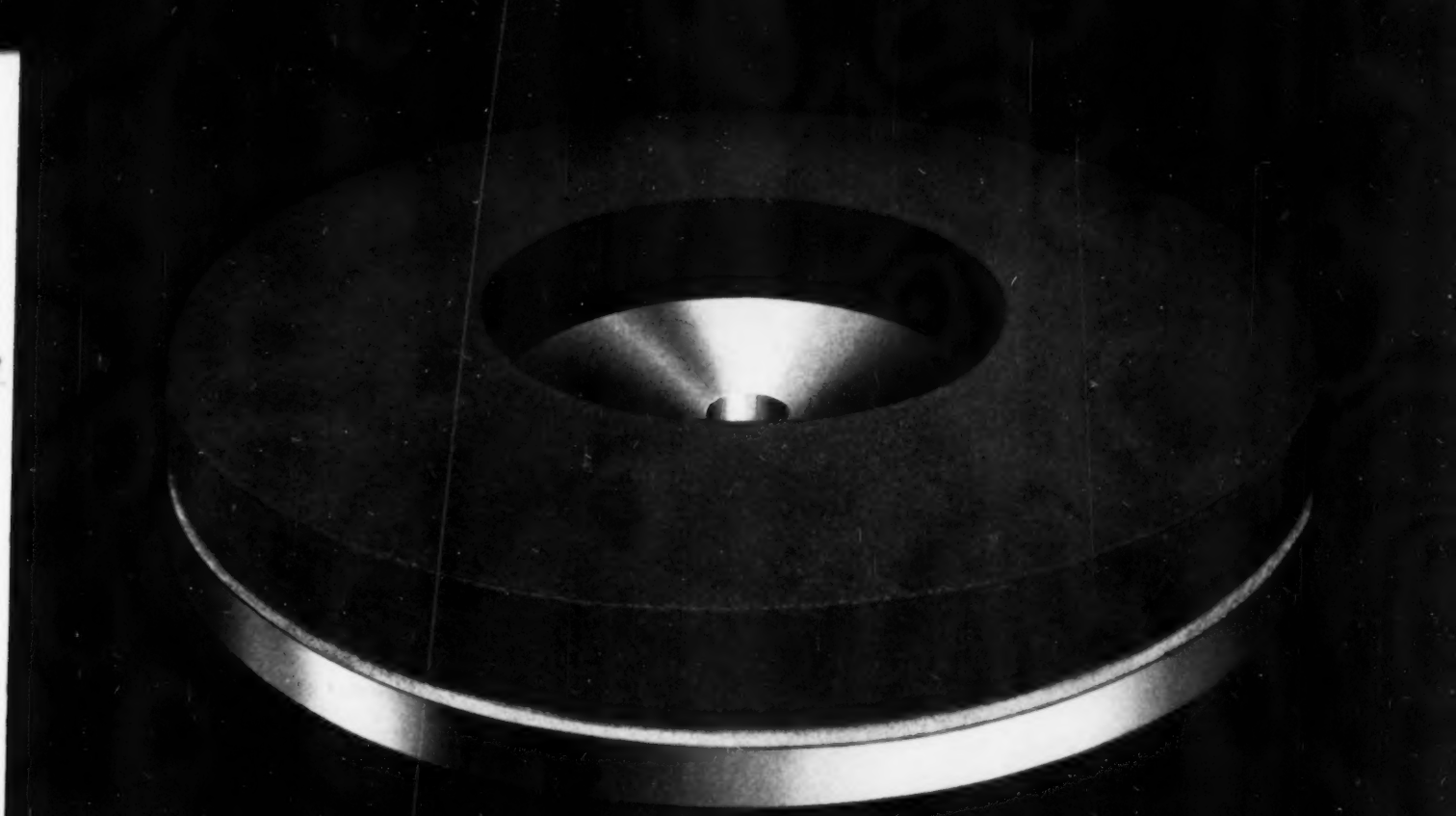
- Straight and Angle Shearing
- Sequence Shearing
- Slitting
- Blanking
- Notching
- Duplicating Straight Side Parts without Dies

The Speed Shear is "loaded" with features which speed and simplify set-up and operation. For time and money-saving details, please request Bulletin SS-1: The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio

SEE OUR CATALOG IN SWEET'S



Lodge & Shipley
. . . your LODGE-ical choice

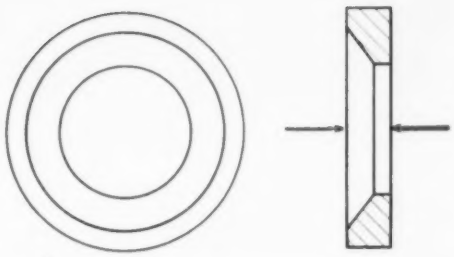


Disc life up 71% with new Gardner GR structure control

...new Gardner abrasives grind 43,567 *more* valve inserts than former discs

production facts

Part	Valve inserts
Material	Carbon steel
Hardness	35 to 60 Rockwell
Machine	Double Disc Grinder
Disc size	26" x 2" x 10"
Production life	Former discs—61,000 parts New Gardner discs—104,567 parts

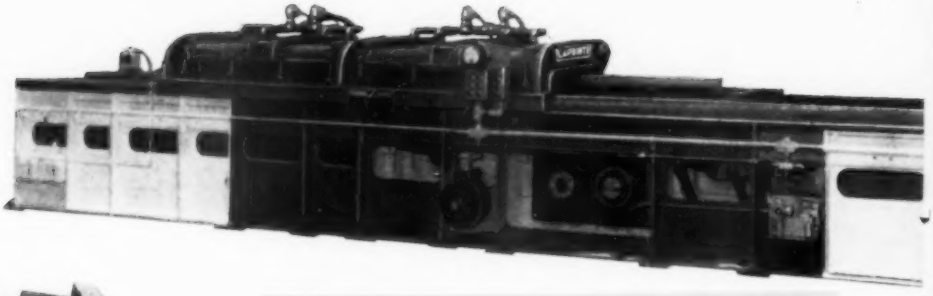


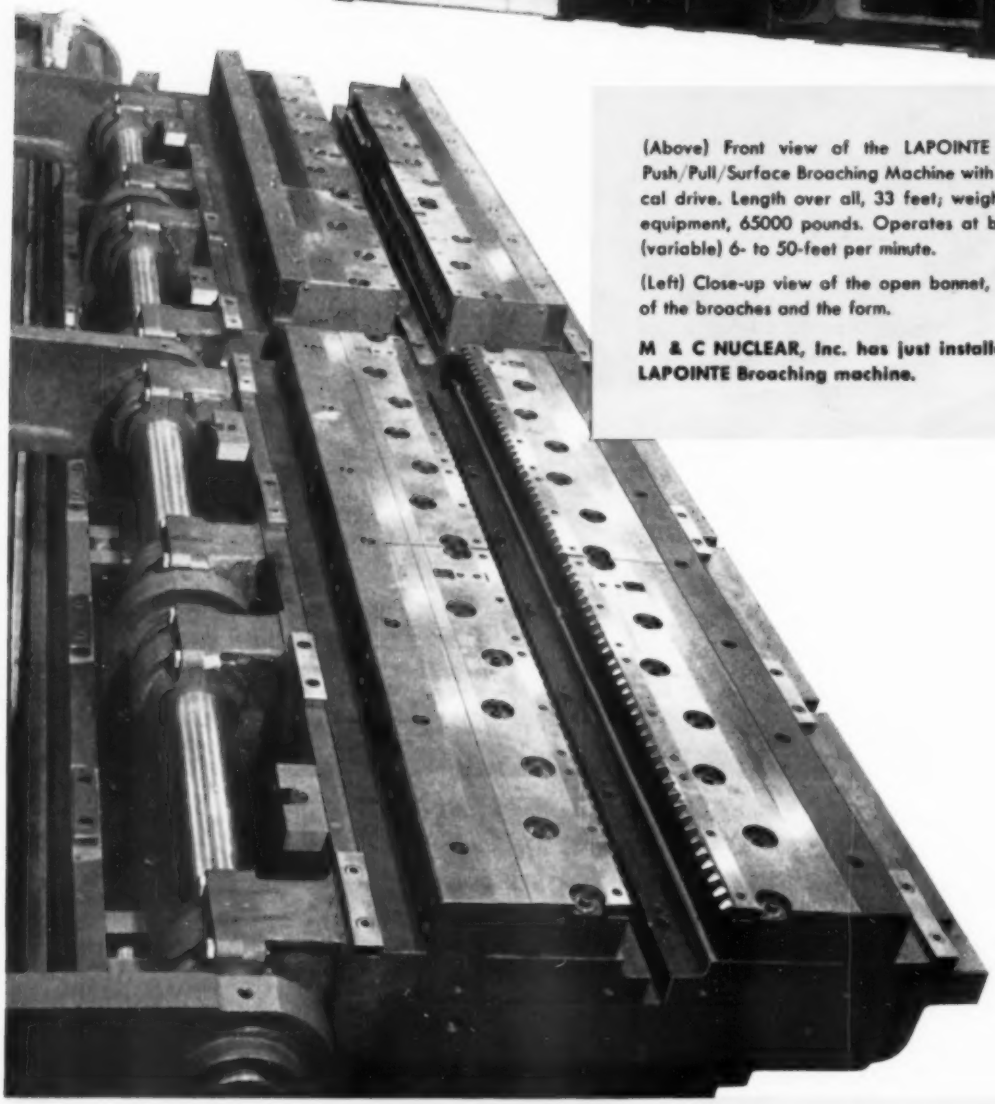
Find out how Gardner's latest developments in abrasive discs can lower your grinding costs! Call your Gardner Abrasives Specialist or write for AC-57 Catalog.

GARDNER

abrasive discs

BELOIT, WISCONSIN



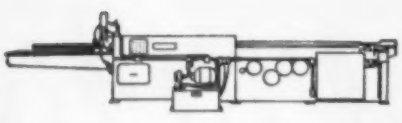


(Above) Front view of the LAPOINTE 180-inch stroke Push/Pull/Surface Broaching Machine with electro-mechanical drive. Length over all, 33 feet; weight, with electrical equipment, 65000 pounds. Operates at broaching speeds (variable) 6- to 50-feet per minute.

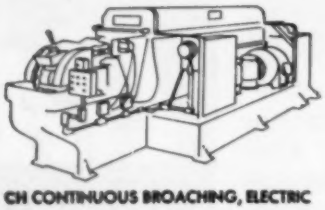
(Left) Close-up view of the open bonnet, showing the size of the broaches and the form.

M & C NUCLEAR, Inc. has just installed this modern LAPOINTE Broaching machine.

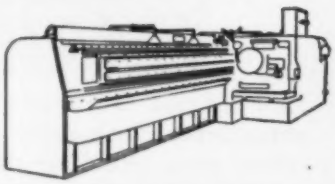
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC

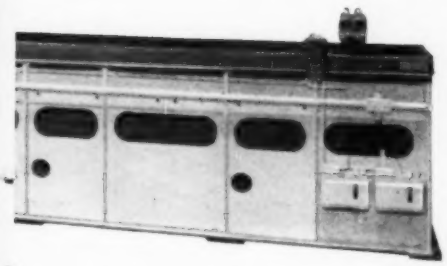


CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

URANIUM ★ TITANIUM ★ ZIRCALLOY ★ 347 STAINLESS



Are you puzzled about BROACHING the materials of this atomic age?

If so, let LAPOINTE —BROACHING solve your problems . . . now!

No one can equal Lapointe's experience in broaching the difficult metals used in today's jets, missiles and nuclear power plants. As far back as 1950, we were broaching test specimens of zirconium — and our research and experimentation have kept abreast of all the metals and alloys in this critical field.

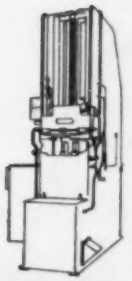
The Lapointe machine shown here is broaching a part in zircalloy, constituting one of the very latest developments of our fast-moving atomic age. Tolerances are close, the part is thin, *and five feet long!* Nevertheless, production is amazingly fast — about 100-to-1 against another metal-removing method that was being used.

Lapointe has been recognized as the undisputed leader in the art of broaching, with nearly sixty years of engineering experience to draw on, *exclusively in broaching.* All of this valuable background is available to you, to solve your most difficult metal-working problems. A request will bring a qualified Lapointe Field Engineer to your plant, promptly.

THE LAPOINTE MACHINE TOOL COMPANY

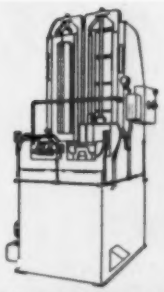
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC

SRVE SINGLE RAM VERTICAL, ELECTRIC



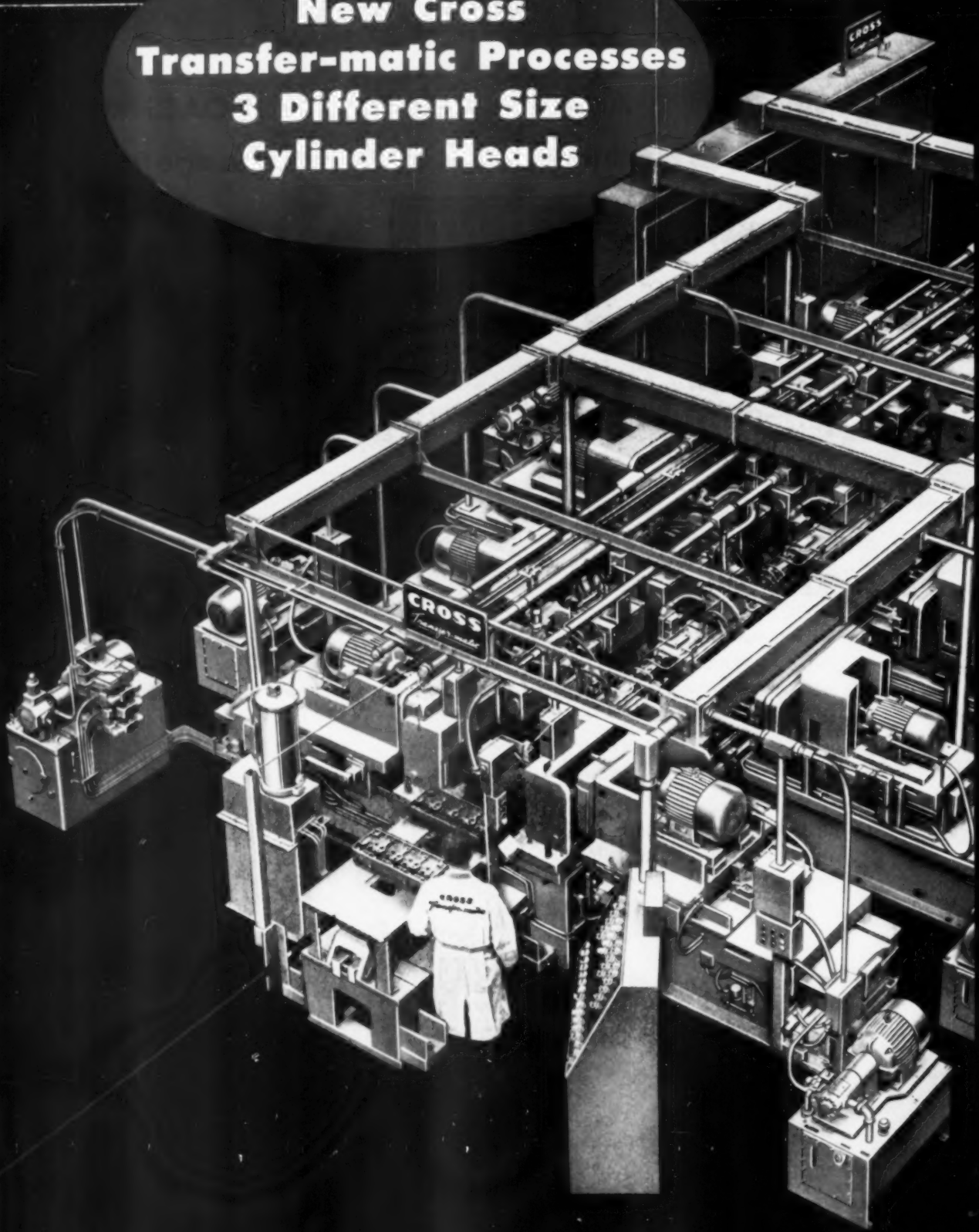
DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

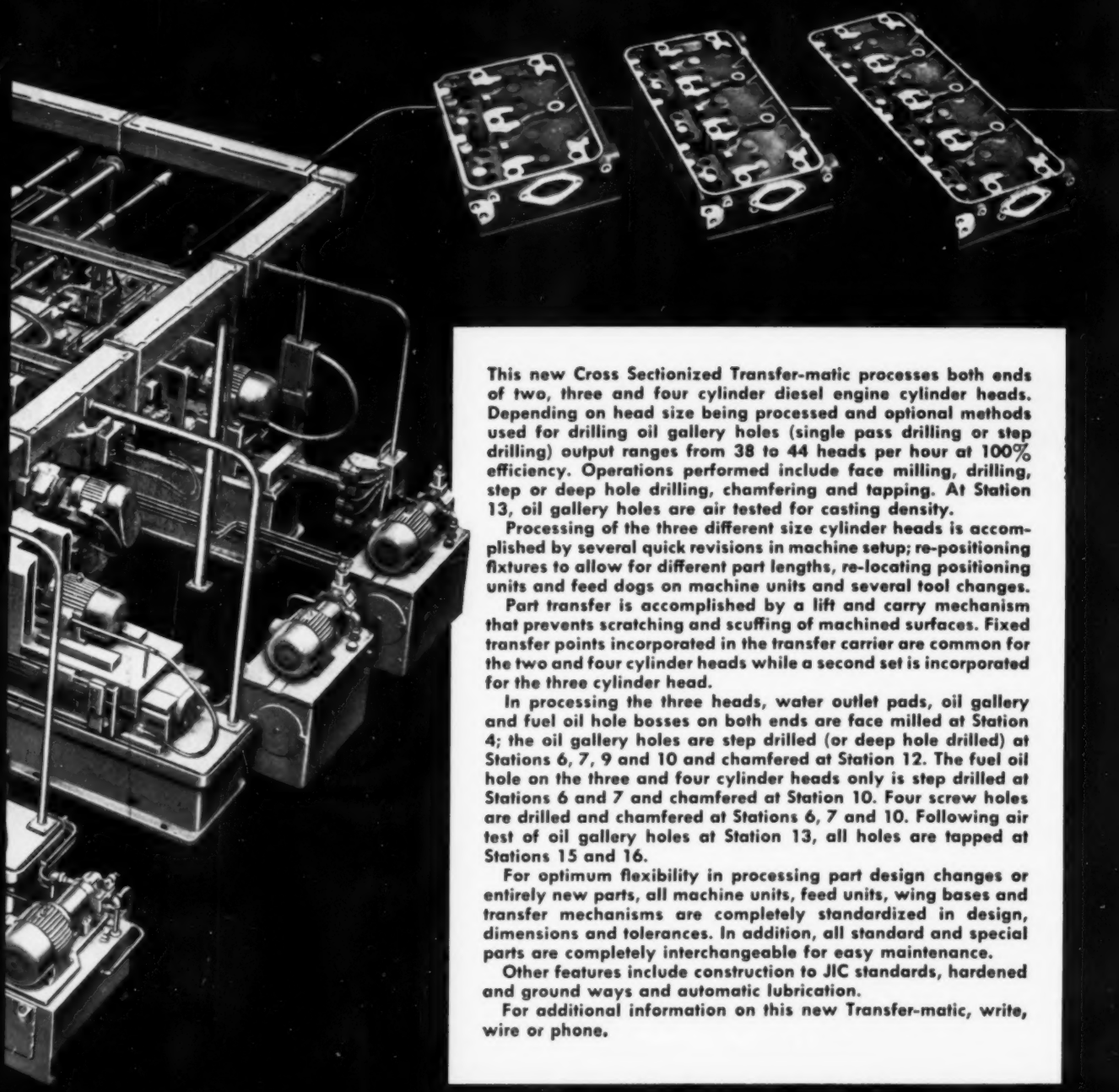
known to be the best in

BROACHING

New Cross Transfer-matic Processes 3 Different Size Cylinder Heads



Another Automation First by Cross



This new Cross Sectionized Transfer-matic processes both ends of two, three and four cylinder diesel engine cylinder heads. Depending on head size being processed and optional methods used for drilling oil gallery holes (single pass drilling or step drilling) output ranges from 38 to 44 heads per hour at 100% efficiency. Operations performed include face milling, drilling, step or deep hole drilling, chamfering and tapping. At Station 13, oil gallery holes are air tested for casting density.

Processing of the three different size cylinder heads is accomplished by several quick revisions in machine setup; re-positioning fixtures to allow for different part lengths, re-locating positioning units and feed dogs on machine units and several tool changes.

Part transfer is accomplished by a lift and carry mechanism that prevents scratching and scuffing of machined surfaces. Fixed transfer points incorporated in the transfer carrier are common for the two and four cylinder heads while a second set is incorporated for the three cylinder head.

In processing the three heads, water outlet pads, oil gallery and fuel oil hole bosses on both ends are face milled at Station 4; the oil gallery holes are step drilled (or deep hole drilled) at Stations 6, 7, 9 and 10 and chamfered at Station 12. The fuel oil hole on the three and four cylinder heads only is step drilled at Stations 6 and 7 and chamfered at Station 10. Four screw holes are drilled and chamfered at Stations 6, 7 and 10. Following air test of oil gallery holes at Station 13, all holes are tapped at Stations 15 and 16.

For optimum flexibility in processing part design changes or entirely new parts, all machine units, feed units, wing bases and transfer mechanisms are completely standardized in design, dimensions and tolerances. In addition, all standard and special parts are completely interchangeable for easy maintenance.

Other features include construction to JIC standards, hardened and ground ways and automatic lubrication.

For additional information on this new Transfer-matic, write, wire or phone.

Established 1898

THE CROSS CO.

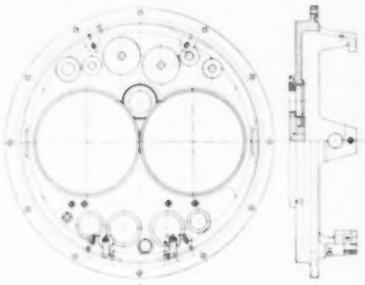
First in Automation

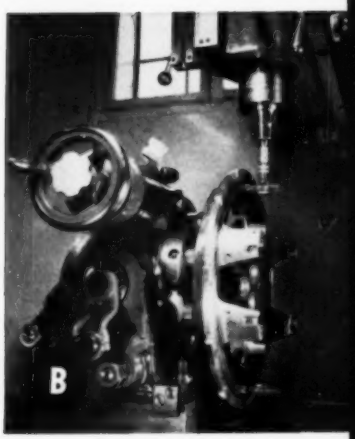
PARK GROVE STATION • DETROIT 5, MICHIGAN

SIP No. 3K JIG BORING MACHINE
Send for Catalog 1173

Illustrated is the machining of a magnesium casting for an electronic unit . . . (A) drilling, boring and counterboring 37 holes, 62 diameters ranging from 0.255″ to 5.125″ . . . (B) drilling, boring and counterboring 11 holes, 16 diameters ranging from 0.100″ to 0.787″. Here's the record:

MACHINING TIME (A).....8 HOURS, 15 MINUTES
MACHINING TIME (B).....2 HOURS, 0 MINUTES





How's that for Production!

The machine that does it is the SIP No. 3K Jig Boring Machine. It has what it takes—ease of operation, increased generous range and capacity, plus the basic Precision that is SIP—to finish critically sensitive jobs like this so fast and so well! SIP quality and precision cost you no more.

and how's this for Accuracy?

HOLE DIAMETERS HELD TO +0.0004″, −0

CENTER DISTANCES HELD TO +0.00025″, −0

SIP *makes Precision Production Practical & Profitable*

AMERICAN SIP CORPORATION

100 EAST 42nd STREET, NEW YORK 17, N. Y.

Since 1926 all SIP Machines delivered to U.S.A. and Canada have been calibrated in the INTERNATIONAL INCH (1″ = 25.4 mm).

CIRCLE 196 READER SERVICE CARD

Get this **New, Up-To-The-Minute Report** *filled with*

Inside Facts on Outside Grinding

A Report on O.D. Grinding, by Norton specialists, describes "tricks of the trade" that get the most out of cylindrical and centerless grinders . . . provides on-the-job performance of different grinding wheels . . . and analyzes the following highly efficient abrasives and bonds.

Abrasives. 44 ALUNDUM* (aluminum oxide) abrasive, an ideal cost-cutter for many O.D. jobs. 32 ALUNDUM abrasive, first choice for grinding various materials, including harder steels. The other time-tested Norton ALUNDUM abrasives are also included. And 37 and 39 CRYSTOLON* (silicon carbide) abrasives are best suited for grinding cast iron, nonferrous metals, carbides and other materials.

Bonds. G bond, biggest advancement in vitrified bonds, gives best results in most O.D. jobs, particularly crush-truing. Vitrified BE bond is another widely used favorite. Where CRYSTOLON abrasive is required, K bond is outstanding. B11 resinoid bond excels in uniformity with both ALUNDUM and CRYSTOLON wheels. For centerless feed wheels, R51 rubber bond assures complete regulating control without slippage.

Your Norton Man will be glad to work with you in solving O.D. problems, to assure you the lowest cost-per-piece produced. How this expert can bring you the value-adding, profit-boosting "Touch of Gold" is stated in the Report, available from your local Norton Representative — and as near as your phone. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

W-1901

Making better products . . . to make your products better

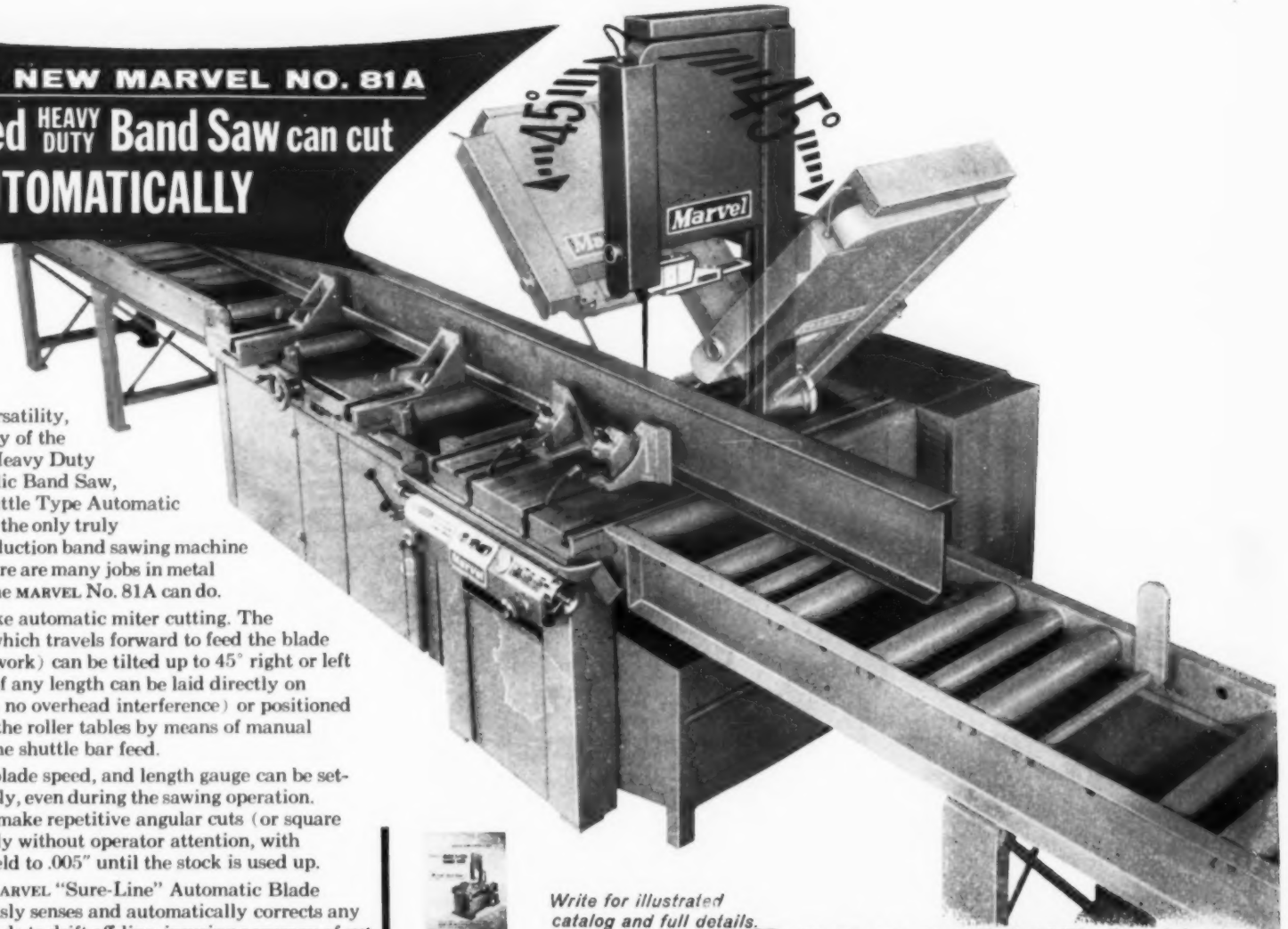
NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEAR MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

CIRCLE 198 READER SERVICE CARD

CIRCLE 199 READER SERVICE CARD ▼

ONLY the NEW MARVEL NO. 81A

High Speed HEAVY DUTY Band Saw can cut miters AUTOMATICALLY



The unequalled versatility, speed, and accuracy of the MARVEL No. 81A Heavy Duty Universal Hydraulic Band Saw, equipped with Shuttle Type Automatic Bar Feed, makes it the only truly multi-purpose production band sawing machine on the market. There are many jobs in metal sawing that *only* the MARVEL No. 81A can do.

For example, take automatic miter cutting. The vertical column (which travels forward to feed the blade through the fixed work) can be tilted up to 45° right or left of vertical. Work of any length can be laid directly on the machine (with no overhead interference) or positioned longitudinally on the roller tables by means of manual power control of the shuttle bar feed.

Feed pressure, blade speed, and length gauge can be set or changed instantly, even during the sawing operation. The machine will make repetitive angular cuts (or square cuts) automatically without operator attention, with length accuracy held to .005" until the stock is used up.

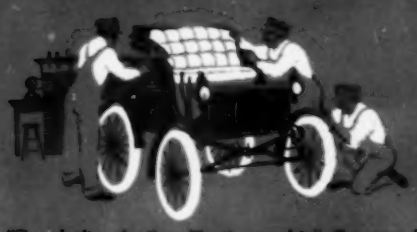
The exclusive MARVEL "Sure-Line" Automatic Blade Control continuously senses and automatically corrects any tendency of the blade to drift off-line, insuring accuracy of cut.

The new MARVEL No. 81 and 81A Series Band Saws—(capacity 18" x 20") are the most advanced band sawing machines on the market. Before you buy *any* saw, see the MARVEL No. 81 Series.

Write for illustrated catalog and full details.

ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVENUE
CHICAGO 39, ILLINOIS

Metal Cutting
MARVEL SAWS
Better Machines—Better Blades



"They don't make them like they used to". They sure don't, they were good — wonderful — for their day and some of them are still running — like they used to

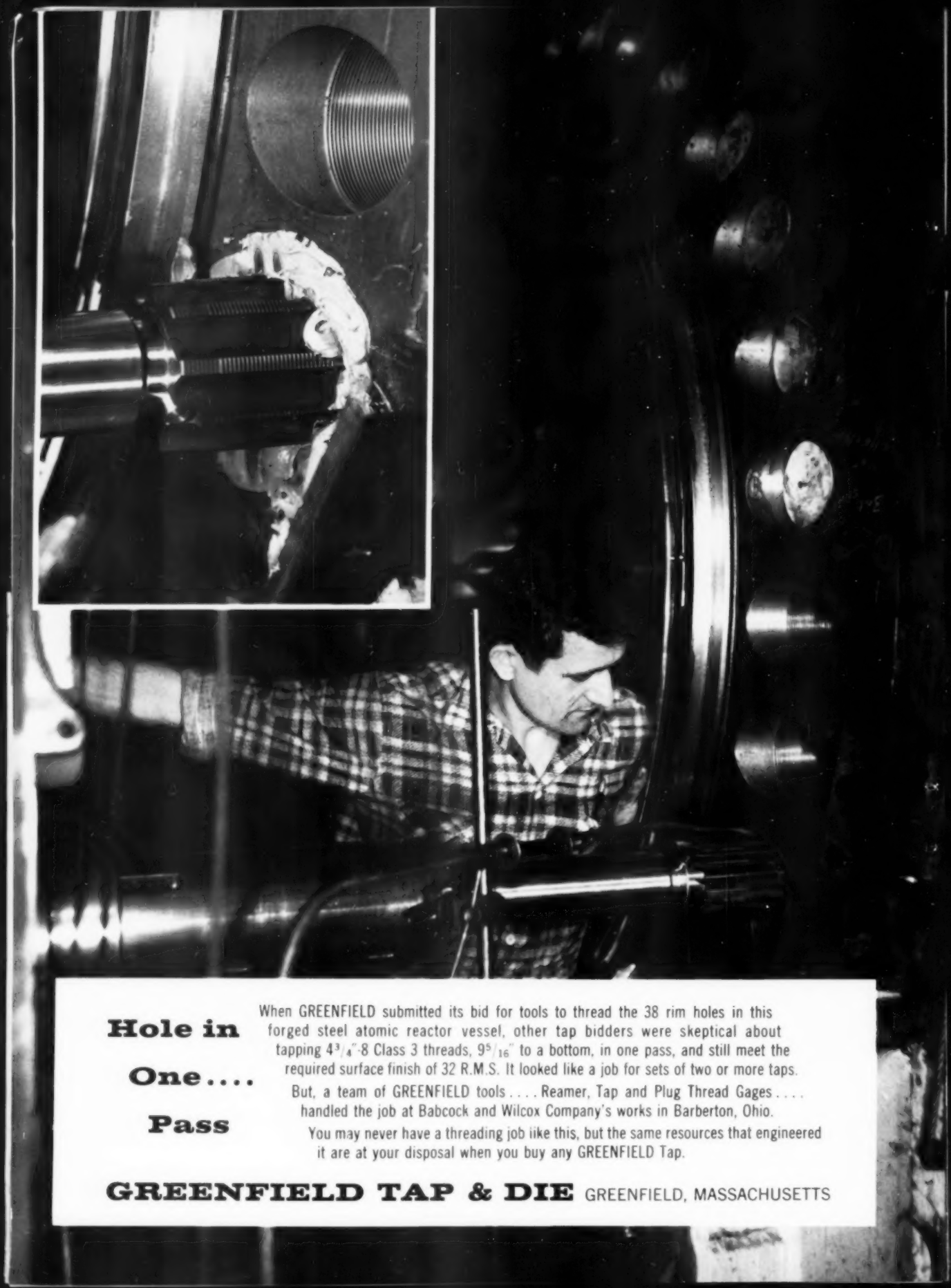
but — With modern design and performance who would prefer an antique to this model? Yet many a shop is running today with yesterday's tooling.

Are you trying to turn out products to today's specifications with yesterday's tooling? Have you die heads 10-20-30 years old that are "as good as new"?

Better let a Geometric man go over your threading operations and show you how New Geometrics can improve your threading and lower costs too!

CALL YOUR GEOMETRIC DISTRIBUTOR TODAY

GEOMETRIC – HORTON NEW HAVEN 15, CONNECTICUT



Hole in One.... Pass

When GREENFIELD submitted its bid for tools to thread the 38 rim holes in this forged steel atomic reactor vessel, other tap bidders were skeptical about tapping $4\frac{3}{4}$"-8 Class 3 threads, $9\frac{5}{16}$" to a bottom, in one pass, and still meet the required surface finish of 32 R.M.S. It looked like a job for sets of two or more taps.

But, a team of GREENFIELD tools .... Reamer, Tap and Plug Thread Gages .... handled the job at Babcock and Wilcox Company's works in Barberton, Ohio.

You may never have a threading job like this, but the same resources that engineered it are at your disposal when you buy any GREENFIELD Tap.

GREENFIELD TAP & DIE GREENFIELD, MASSACHUSETTS

Hydraulic Cylinder Manufacturer Specifies

Loading a minimum quantity of Ostuco tubing at the Shelby mill — in this instance only 150 feet.

"When you make hydraulic cylinders in 11 bore sizes . . . dozens of different pressure ratings . . . a variety of wall thicknesses and analyses — you've got a man-size tubing inventory problem.

"That's why we switched to Ostuco tubing made to our *exact specifications*. We like its availability in truly *small minimum quantities*. And with its consistently close tolerances, shipment after shipment, Ostuco tubing has *cut our machining time over 50 percent* . . . "

This is an actual case history of a manufacturer with a severe inventory problem. He required special tubing grades in minimum quantities. If you're faced with a similar situation, it's time you contacted your Ohio Seamless representative, listed in the Yellow Pages, or the mill at *Shelby, Ohio — Birthplace of the Seamless Steel Tube Industry in America.*

AA-8843

OSTUCO TUBING

OHIO SEAMLESS TUBE DIVISION

of Copperweld Steel Company • SHELBY, OHIO

Be sure to visit Booth 205, Design Engineering Show, May 25-28, Philadelphia.

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, St. Petersburgh, Salt Lake City, Seattle, Tulsa, Wichita CANADA: Railway & Power Engr. Corp., Ltd. EXPORT: Copperweld Steel International Company, 225 Broadway, New York 7, New York

Already a Great Success!
The Amazing New AO R-90
"RED DEVIL"
Respirator Filter

The "Red Devil" is a real advance — brought about by research to provide you with the finest protection against dusts and mists. A variable density filter with built-in prefilter. Long service life — low breathing resistance — extremely high filtering efficiency are features. Outperforms previous filters yet is available to you at no extra cost. An American Optical Company exclusive — insist on it. "Red Devil" filters are available in the AO Respirators shown below.

The R-5090 "Red Devil" Respirator

Bureau of Mines APPROVED for protection against dusts not significantly more toxic than lead, pneumoconiosis-producing mists and chromic acid mist. A double cartridge respirator — has two variable density filters and two built-in prefilters. R-90 "Red Devil" Filters for the R-5090 Respirator are available in package of 10 or package of 100.

The R-2090 "Red Devil" Respirator

Bureau of Mines APPROVED for protection against dusts not significantly more toxic than lead, pneumoconiosis-producing mists and chromic acid mist. R-90 "Red Devil" Filters for the R-2090 Respirator are available in package of 5 or package of 50.

Made only by American Optical Company, world's leading manufacturer of personal safety equipment. Your nearest AO Safety Products Representative can supply you or write for literature.

Always insist on AO Trademarked Safety Products

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

If you finish machined parts
this report is for YOU
Published by Norton
Available from your Norton Representative
Special Report on . . .
BARREL FINISHING OF MACHINE PARTS
How the Tumbling Process Can Reduce Finishing Costs
Published by NORTON COMPANY
General Offices: Worcester 6, Mass.
NORTON ABRASIVES

Barrel-Finishing Machined Parts, one of a Norton series of reports, is based on the outstanding advantages of barrel-finishing over hand-finishing for many jobs.

Written by Norton Abrasive Engineers, who serve all industry, it tells you how barrel-tumbling improves surface finish and fatigue strength, removes burrs, forms uniform radii and reduces the production costs of all types of machined parts. And it describes how many users have found TUMBLEX* abrasives ideal for these applications. For example:

Manual finishing of large fabricated aircraft gears with a 4" wide tooth took eight hours each and left the tooth ends rough. With barrel-finishing, using random shaped ALUNDUM* TUMBLEX *"A" abrasive in combination with* TUMBLEX *"T" triangles, the gears could be tumbled in pairs producing uniform radii and a uniform, refined surface on the entire tooth.*

Deburring of a tube 2" long, ½" I.D., externally threaded, would normally require triangular tumbling abrasive, which would eliminate wedging. But since the I.D.'s also required smoothing, we found ALUNDUM TUMBLEX *"S" spheres rolled freely in and out, without wedging or damage to threads.*

Get this report from your Norton Representative. It's as near as your phone. He'll also gladly supply facts and literature on all TUMBLEX Types: "A" (random shaped chips), "T" (bonded triangles), "S" (bonded spheres), and "N" (natural stones), covering all finishing requirements, on the widest range of materials. And for better, lower cost finishing of your work parts, send samples to our Sample Processing Department. They'll be finished and returned to you promptly, with complete facts as to abrasives, methods and equipment. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

G-363

NORTON ABRASIVES

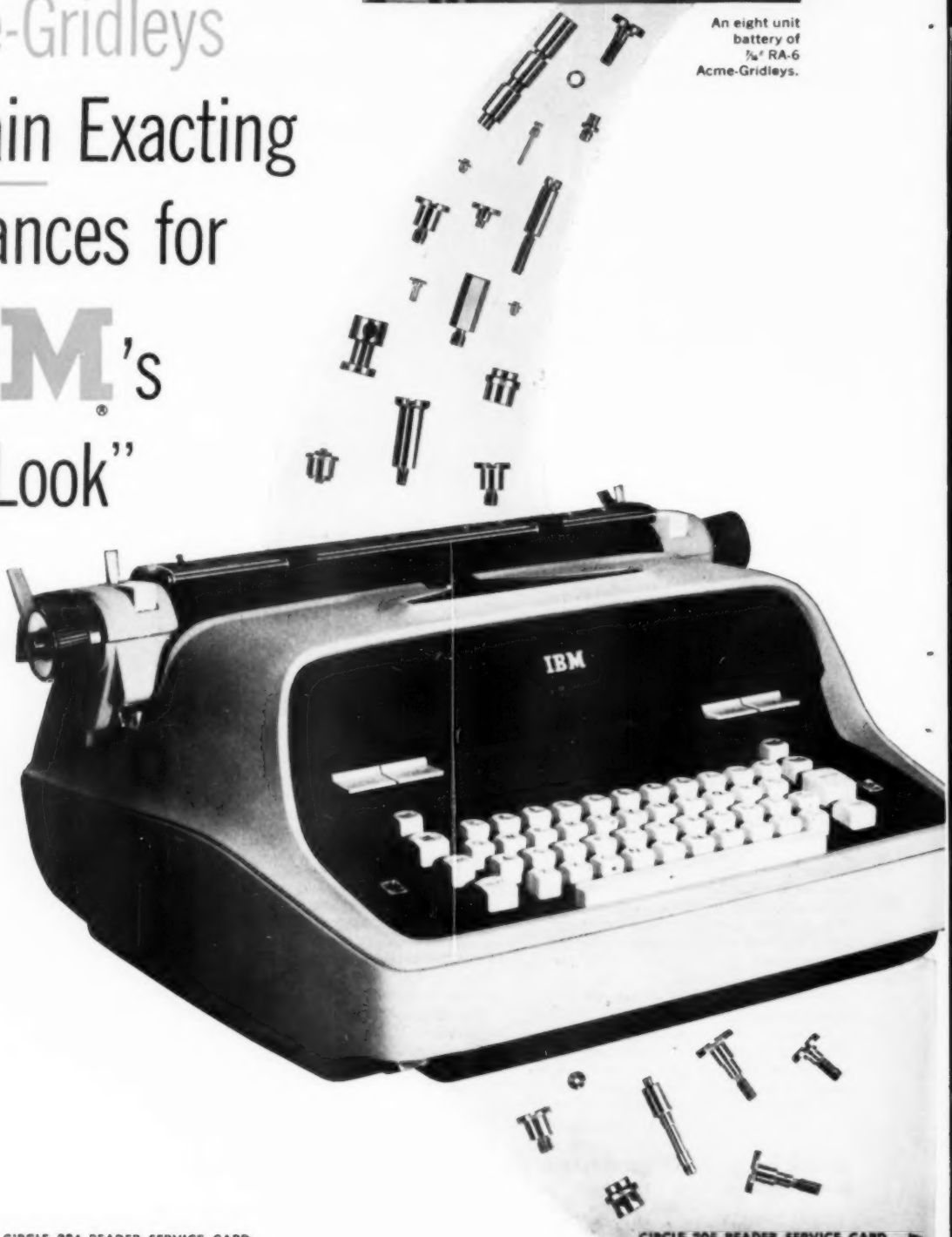
Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

First Precision Component
in the Run . . . or Last

Acme-Gridleys Sustain Exacting Tolerances for IBM®'s "New Look"

An eight unit battery of 7/64" RA-6 Acme-Gridleys.



CIRCLE 204 READER SERVICE CARD

CIRCLE 205 READER SERVICE CARD ►

Close-up of rear side of tooling zone showing slotting attachment in the 5th position.

At IBM's modern Lexington, Kentucky plant, twenty Acme-Gridley 7/16" six spindle automatics are mass-producing the small to miniature parts for their sleek new electric typewriter. They help to provide IBM with greater *sustained* accuracy at lower cost than other comparable machines.

The precision components are held to closely controlled tolerances of .0005 t.i.r. These limits apply to the last piece in the run as well as the first, and consistent accuracy is maintained with less machine adjustment than ever before realized. Sustaining the closely controlled tolerances of these parts completely minimizes costly rejections during exhaustive quality control checks of the completed units. Inspection time is greatly reduced.

IBM has also found that the wide-open tooling zone of their 7/16" Acme-Gridleys permits much greater latitude in tooling up for complicated operations performed in a single set-up. This, plus the lasting accuracy of direct camming and the flexibility of independently operated toolslides, makes this newest member of the Acme-Gridley family a profitable asset to IBM's modern production line. Write for Bulletin

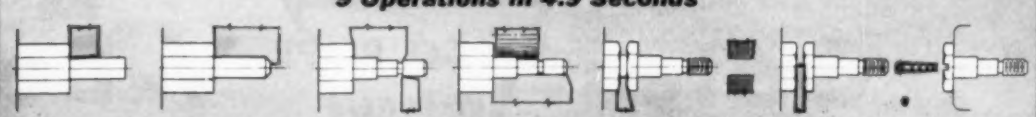
Pioneer in Circumferential Automation

National Acme

The National Acme Company
171 E. 131st Street
Cleveland 8, Ohio

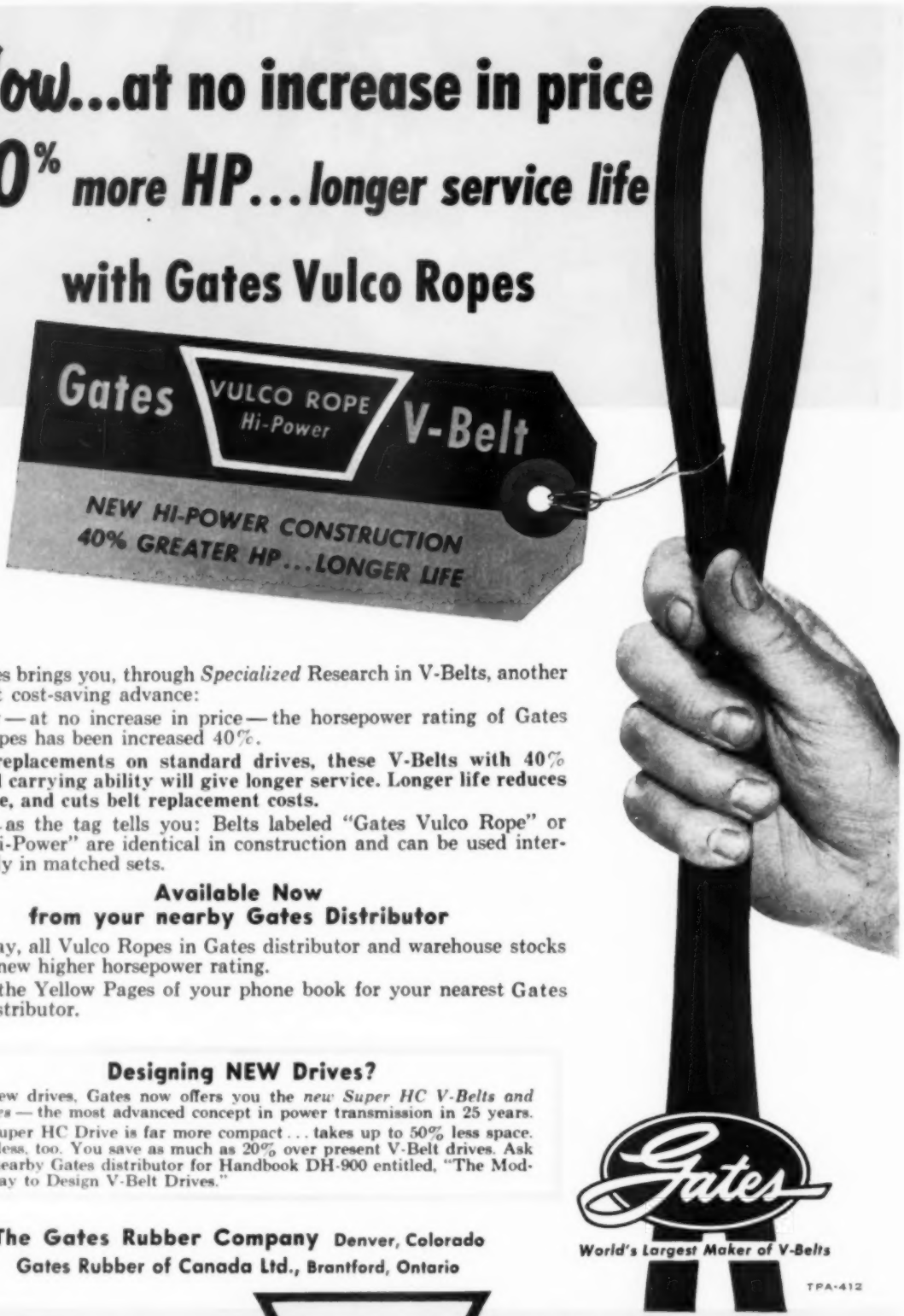
Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

9 Operations in 4.9 Seconds



6. Rough Turn Front End
1. Rough Form and Chamfer Front End
2. Finish Form Two Diameters Finish Turn Thread Diameter
3. Shave Three Diameters
4. Breakdown for Cutoff-Thread
5. Cutoff-Pickup and Slot

Now...at no increase in price
40% more HP...longer service life
with Gates Vulco Ropes



Gates brings you, through *Specialized* Research in V-Belts, another important cost-saving advance:

Now—at no increase in price—the horsepower rating of Gates Vulco Ropes has been increased 40%.

As replacements on standard drives, these V-Belts with 40% more load carrying ability will give longer service. Longer life reduces down-time, and cuts belt replacement costs.

And as the tag tells you: Belts labeled "Gates Vulco Rope" or "Gates Hi-Power" are identical in construction and can be used interchangeably in matched sets.

Available Now
from your nearby Gates Distributor

Today, all Vulco Ropes in Gates distributor and warehouse stocks have the new higher horsepower rating.

See the Yellow Pages of your phone book for your nearest Gates V-Belt distributor.

Designing NEW Drives?

For new drives, Gates now offers you the *new Super HC V-Belts and Sheaves* — the most advanced concept in power transmission in 25 years. The Super HC Drive is far more compact . . . takes up to 50% less space. Costs less, too. You save as much as 20% over present V-Belt drives. Ask your nearby Gates distributor for Handbook DH-900 entitled, "The Modern Way to Design V-Belt Drives."

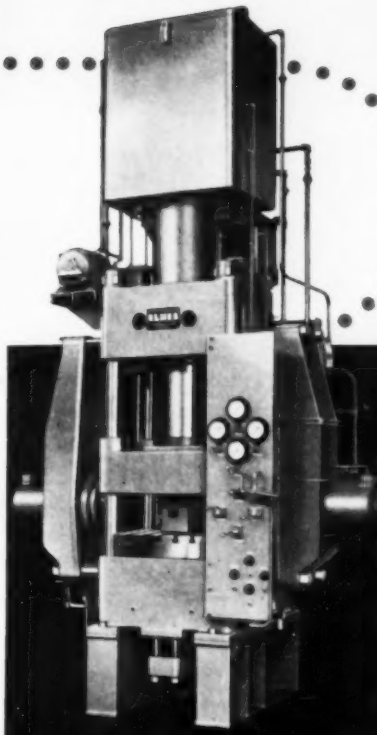
The Gates Rubber Company Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates
World's Largest Maker of V-Belts

TPA-412

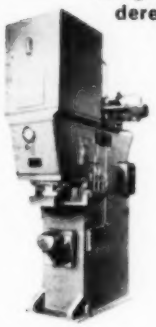
Gates VULCO ROPE Hi-Power V-Belts

Because of what this unique DEVELOPMENT PRESS tells us...

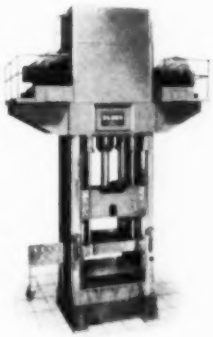


no pressing problem is too tough for an ELMES "Job-Fitted" HYDRAULIC PRESS

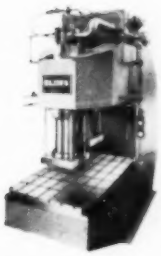
Elmes Presses are built in standard and special designs for metal drawing and forming, bending, straightening, forcing, powdered metal compacting, hobbing, etc.



HORNING PRESSES — for coining and truing wheel rims and similar items. Built in a wide range of sizes and capacities.



DOUBLE-ACTION DRAWING AND FORMING PRESS with 300-ton main slide and 100-ton blankholder slide. (Total tonnage is available for single action.) Single and Triple-Action types also available.



SPECIAL 600-TON C-FRAME PRESS — an adaptation of a standard C-Frame design. Combines two 300-ton presses in one. The unit can be operated with both cylinders in unison, or as individual presses.

The ingenious try-out press shown above is an exclusive creation of Elmes engineering. Center of activity in the Elmes Research Department, this versatile unit, with *four rams*, can be set up on *almost any operation that a hydraulic press is normally called upon to perform.*

Thus, a customer's out-of-the-ordinary metal pressing work can be tried out, and specifications for a production press of maximum efficiency accurately determined—not just on paper, but after having been *performance-proved under actual working conditions.*

Research with this press also permits the engineering of greater unusual-job adaptability into standard Elmes® Presses. As a result, where a standard Elmes Press does not fully meet a customer's requirements, it can be readily, efficiently, and economically modified in design.

Send us *your* pressing problem—you'll find that Elmes facilities can save time and money on your development work. See your Elmes Distributor, or write direct.

Elmes American Steel Foundries ENGINEERING DIVISION

1161 Tennessee Avenue, Cincinnati 29, Ohio

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

CIRCLE 207 READER SERVICE CARD

HERE'S LOW COST

Heavier . . . smoother running . . . greater accuracy. Compare features. Only the Reid grinders offer you so many quality extras. Designed by Reid Bros., the most respected name in Surface Grinders . . . since 1901.

DUST GUARDING . . . Neg'-ator stainless steel roll type dust guards.

WORK HEIGHT . . . a full 15¼" from top of table to bottom of 7" wheel.

REID PRECISION

REID 618 P
POWERED MODEL

REID GERMANIUM
SLICING MACHINE

REID-O-MATIC 624
ALL ELECTRIC MODEL

REID ELECTROLYTIC
SURFACE GRINDER

PRECISION GRINDING

WITH REID'S NEW HAND FEED MODELS 612 AND 618HA

More stability . . . *more* work height . . . *more* grinder, dollar for dollar!

These models are twice the weight of typical grinders in this size. Heavy, rugged construction eliminates vibration and resulting rejects. Reid hand feed grinders feature a full 18" center distance on the cross slide ways, *too* . . . another factor for greater stability.

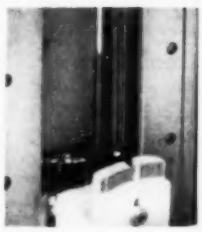
Vertical work height is now a whopping 15¼" from the top of the table to the bottom of the 7" wheel. The entire head and head way are dovetail mounted and designed for years of trouble-free use. Check the finger tip controls, underguarding, one-shot lubrication and a dozen other Reid features.

Dollar for dollar, you'll agree REID grinders are your soundest investment for your toolroom grinding.

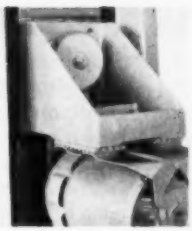
- Heavier than comparable grinders
- Longer ways for stability and wear
- 18" Center distance on cross slide ways
- Full 15¼" work height with a 7" wheel
- Sealed anti-friction bearings
- More horsepower
- Belt driven or motorized spindle available
- Cross slide lock standard equipment

SPECIFICATIONS

CAPACITY	7" (wide) cross slide travel 14" long table travel (612) 20" long (618HA) 15¼" vertical height from top of table to underside of 7" wheel
OVERALL HEIGHT	68"
BELT DRIVEN SPINDLE	1 H.P. Motor 3450 RPM Spindle 2950 or 3450 RPM
MOTORIZED SPINDLE	1 H.P., 3450 RPM offered at slight additional cost
NET WEIGHT	1425 lbs. (612) 1525 lbs. (618HA)
LUBRICATION	One-shot system included as standard equipment. Automatic lubrication available at extra cost.
OPTIONAL EQUIPMENT	J.I.C. and/or 110 Volt Controls
CHROME WAYS	



HEAD & HEAD WAY . . . dovetail mounted. The Head can be driven in both directions.



BELT DRIVEN SPINDLE . . . utilizes 1 H.P. 3450 RPM. Double sheaved to permit 2950 RPM or 3450 RPM spindle speed.

MOTORIZED SPINDLE . . . optional, can be furnished at slight increase in cost. 1 H.P. — 3450 RPM.

ONE-SHOT LUBRICATION . . . Bijur system for all way surfaces. Non-clogging. Convenient.

HANDWHEELS . . . all conveniently located. Full 9" Table handwheel less tiring . . . may be disengaged, rotated to any desired position, re-engaged.

SURFACE GRINDERS

PRECISION SURFACE REID GRINDERS

Manufacturers of precision surface grinders for production and toolroom needs

REID 618 PT WITH WET GRINDING ATTACHMENT

REID COOL GRINDING ATTACHMENT SHOWN ON COLUMN.

REID BROTHERS COMPANY, INC.
159 ELLIOTT STREET • BEVERLY, MASSACHUSETTS

Write for descriptive literature . . . specify model: 612 618HA

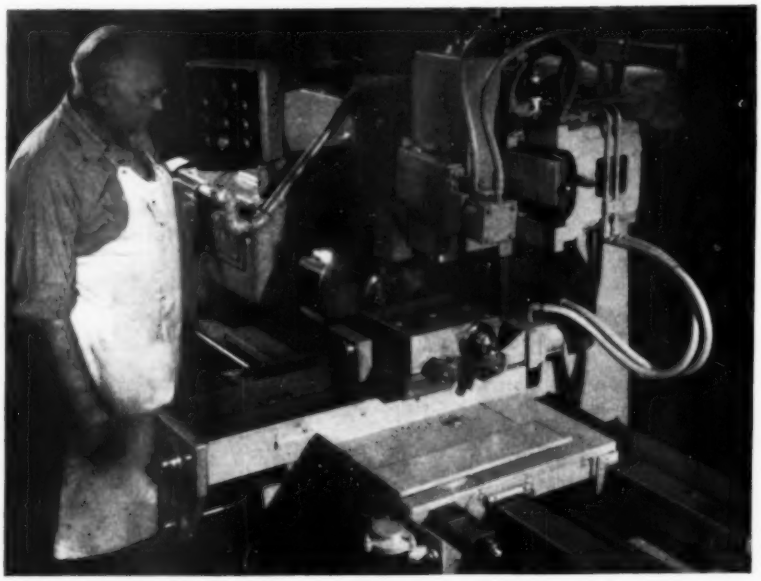
CIRCLE 209 READER SERVICE CARD

SUNDSTRAND

"ENGINEERED PRODUCTION" NEWS

Automatic Lathe Precision Bores and Faces at Twice the Former Rate

Special tooling on this Sundstrand automatic lathe boosted production of pump housings to double that formerly produced on conventional precision boring equipment. The lathe is set up to bore and cross face the pump housing with the tool on the front slide and, with an additional tool on an overhead slide, face the open end all in one automatic cycle. Precision setting of the tools and slide makes possible the extremely close boring limits and flatness in relation to the bore. Six different sizes of pump housings are handled on this one machine with production runs averaging approximately 200 pieces.



When tolerances are close and production runs of moderate length, that's a situation made to order for Sundstrand "Engineered Production." The processing, machine design, and tooling skills put to work to find not only a "better than before" but a "best" solution, are your guarantee of success. Solutions like this one, that eliminate the need for a second operation machine, keep the capital investment at a minimum, too. Because Sundstrand builds a complete range of automatic and tracer turning equipment, including complete lines incorporating automatic handling, you are sure to get the best equipment for your job. Semi-standard machines using a high percentage of standard components hold down engineering and over all machine costs.

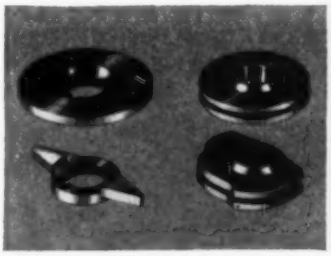
Additional information on Sundstrand solutions to every type of turning problem is contained in bulletin titled "Engineered Turning Production." Write today for your copy.

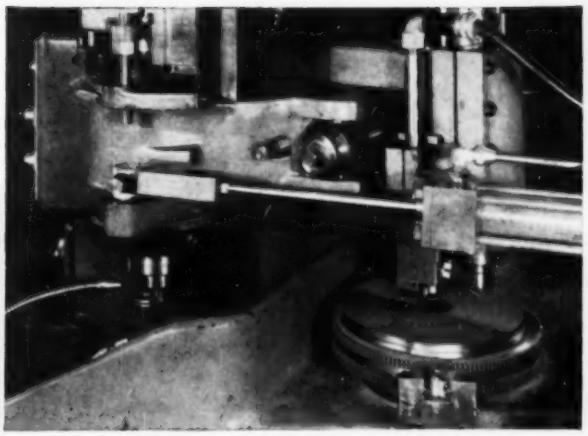
AUTOMATIC LATHES | RIGIDMILS | SPECIAL MACHINES | DRILLING MACHINES | GRINDERS

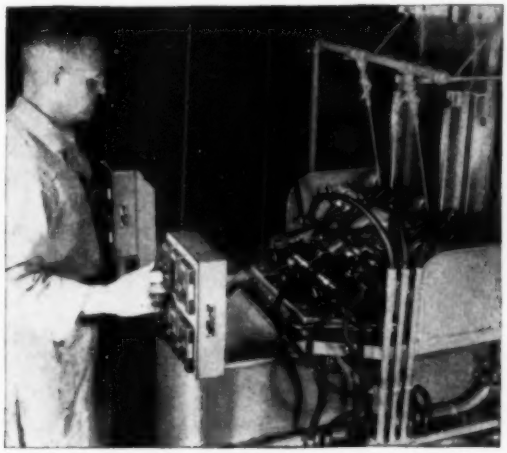
SUNDSTRAND

Cam Contour Mill Handles a Wide Range of Work

Almost any part up to 5-in. diameter and requiring contour milling can be machined automatically on this standard cam controlled Sundstrand machine. Parts with either internal or external contours are produced on this single machine for such varied end products as business machines, governors, ordinance equipment, etc. Sundstrand Contour Mill has one vertical cutter spindle and one cam follower spindle mounted together on a pivoting arm. Ratio between cam roller arm and cutter arm is 2 to 1, reducing any possible cam error ½ on the finished part. Cutter spindle is driven by "vee" belt from a ¾ hp variable speed drive producing infinitely adjustable speeds from 400 to 2500 rpm. Up to 24 different machine cycles are possible on one standard machine with all cycle changes made by pushbutton control.

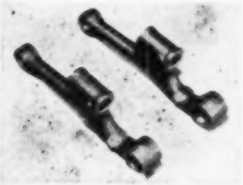






Two Surfaces 70 Degrees Apart Broached in One Stroke

A two position fixture plus a specially designed surface broach enable this Sundstrand broaching machine to maintain high production of steering knuckle supports. The two pads being broached are 70° apart so the two broaches are mounted in a vertical line with a gap of 12" between them. The parts are clamped automatically, move forward into broaching position on the receding worktable, and tilt forward 70° automatically after the first broach has passed so that second surface can be finished. This job illustrates the benefits that can be derived from using Sundstrand as the single responsible source to provide the broaching tools, fixturing, and machine.



Tracer Equipped Rigidmil Cuts Job Times Up to 75%

The Sundstrand C-5 Rigidmil equipped for tracer milling lost no time in effecting major savings when put on the job machining tool steel. Here are the savings on two typical jobs with lower setup time providing an extra benefit.

Job No. 1 — Part 12 in. wide, 36 in. long requiring up to 1¾ in. of stock removal. Total cutting time of 4 hours compared to 12 hours by the previous method results in a saving of over 67%.

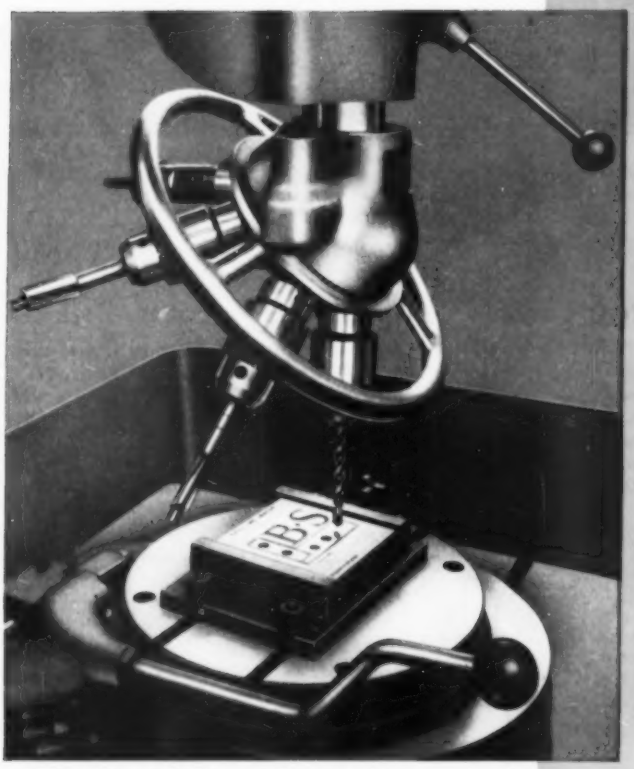
Job No. 2 — Part 4 in. wide, 24 in. long, up to 1 in. of stock to be removed, 30° incline, 12 in. long. Total cutting time reduced to 2¼ hours from 9 hours formerly, a saving of 75%.

Want more milling facts? Write today for your copy of bulletin 103. "Engineered Milling Production"

BROACHING TOOLS BROACHING MACHINES PRESSES

SUNDSTRAND
MACHINE TOOL CO.
2533 Eleventh St. • Rockford, Ill., U.S.A.

Now... from Brown & Sharpe's the turret drilling machines



The Brown & Sharpe Turret Drilling method utilizes a machine on which all six spindles work on a single axis. As the turret is indexed from spindle to spindle, the tool in use is locked into accurate alignment with the main machine spindle. Simultaneously, the work is rapidly and accurately positioned by means of a Brown & Sharpe work-positioning table.

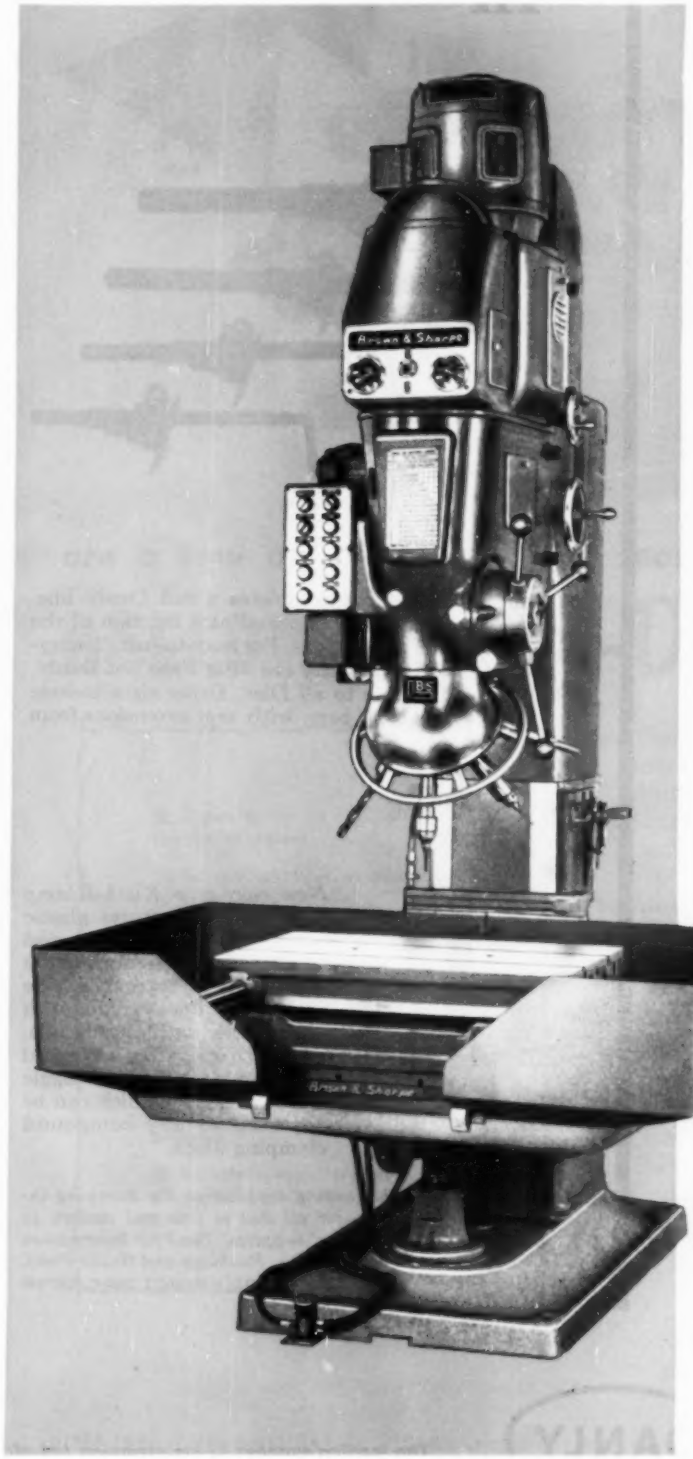
The result of this technique is an increase in production up to 5 times as compared with conventional multiple or gang-type drill presses.

MODEL A 6 spindles • 1/2" drilling and tapping capacity in steel • preselective spindle speeds, 200-4000 rpm, infinitely variable, on each spindle • preselective electrical tapping and depth controls on each spindle • table work surface 22"x24"

newest division...

that are saving up to 80% in

- drilling
- tapping
- boring
- reaming



Brown & Sharpe Turret Drilling Machines were developed by Howe & Fant, Inc., now a division of Brown & Sharpe Mfg. Co.

A revolutionary concept in drilling and tapping equipment, these turret drilling machines have been proved over a period of many years in all types of drilling operations, with records of 2 to 5 times greater productivity than with conventional gang drill box-jig methods.

Find out how Brown & Sharpe Turret Drilling Machines can help you make multiple savings in your drilling and tapping operations — in handling time, set-up time, capital investment, floor space and maintenance. For complete information, write: Brown & Sharpe Turret Drilling Division, Inc., 20 Fitch Street, East Norwalk, Connecticut.

MODEL B 6 spindles • 1" capacity in steel • preselective spindle speeds, 125-2000 rpm, infinitely variable on each spindle • preselective spindle feeds, .0025-.021" per revolution, infinitely variable on each spindle • preselective electrical tapping control and depth control on each spindle • preselective turret index, manual or power • table work surface 28" x 32". Machine functions may be combined with any standard numerical control (tape control) system for fully integrated automatic machining and work positioning.

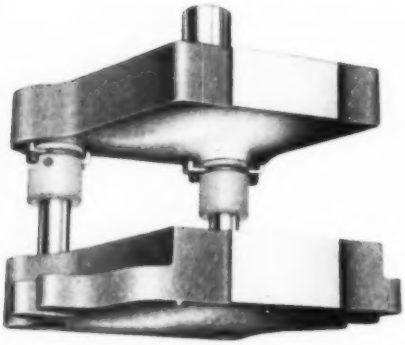
Brown & Sharpe

TURRET DRILLING DIVISION, INC.

BS

There's Always Something New at DANLY

in



New Danly Demountable Die Sets offer you uniformity in a precision fit never before achieved in die sets. Danly Demountable Bushings seat with a tap fit, flush against the ground face of the punch holder with the bore perpendicular to that surface. They are *pre-fitted* in manufacturing so accurately that they are interchangeable. You get 100% bearing every time.

Bushings are easily removed for die work or grinding and returned to proper fit, always. Products of Danly's 36 years' experience, Danly Demountable Bushing Die Sets are stocked near you, giving you fast delivery from a local source.

in

The New Danly Bronze Plated Demountable Bushings are recommended for use on all Die Set applications requiring high surface speeds, especially with side thrust loads. They are manufactured to the same degree of precision fit as hardened steel and bronze bushings. Factory pre-setting is extremely accurate and reliable . . . lets bushings and guide posts work interchangeably. Available in both shoulder and short shoulder design . . . also in shoulder guide post bushings.

in

New 5/16" Die Stop completes a full Danly line. Economical, the stop is priced at a fraction of the cost of handmade versions. For easy-to-install, easy-to-use Die Stops, specify the "Big Four" of Danly. They're adaptable to all Dies. Other sizes include 3/16", ¼", and ⅜" bars, with arm extensions from 3" to 6".

in

New easy-grip Kwik-Klamp Toggle Clamp features plastic handle for more comfort and convenience. New fork bar is more versatile, stronger. The new clamps are available with either straight or flanged bases, and with swivel or universal adapters. It is the only toggle clamp available which can be adjusted to any compound clamping angle.

Look to Danly, the leading supplier in the stamping industry, for progress—for all that is new and modern in Die Sets and Die Makers' supplies. Send for information on Dowel Pins, Socket Screws, Bushings and Guide Posts, Roller Stock Guides, etc. Or simply contact your nearest Danly branch or distributor.

DANLY MACHINE SPECIALTIES, INC.

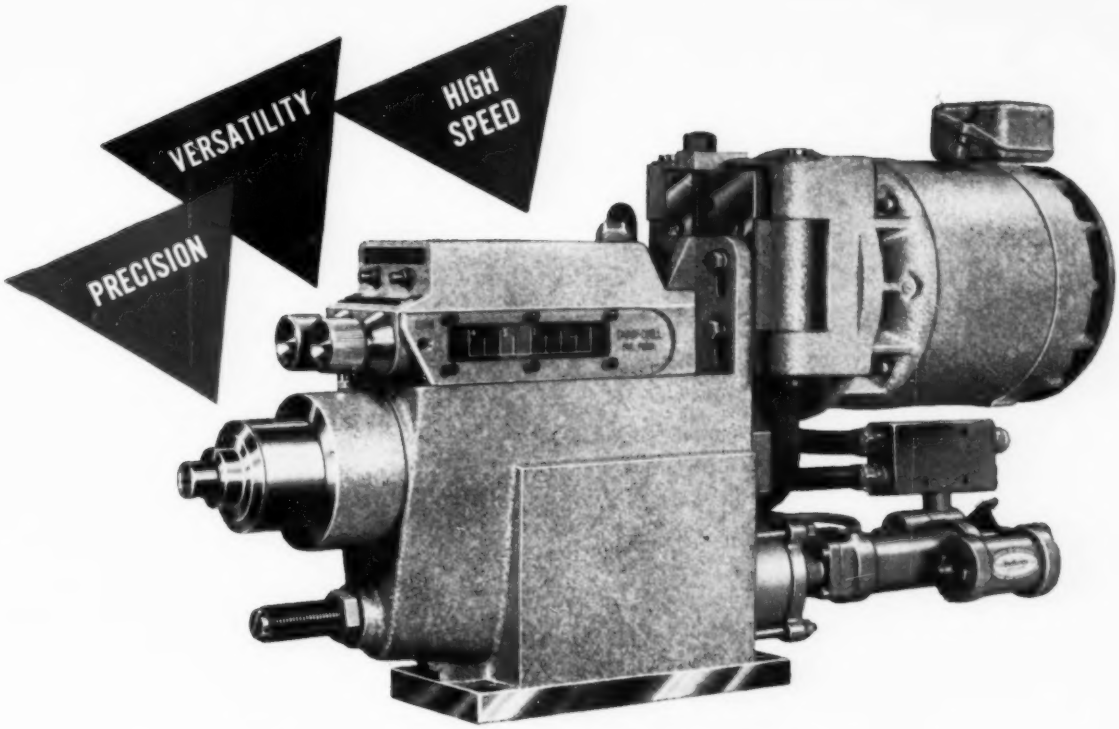
2100 S. Laramie Avenue, Chicago 50, Illinois

DANLY

The leading supplier to the stamping industry

Die Sets • Die Makers' Supplies • Mechanical Presses

CIRCLE 214 READER SERVICE CARD



are a few of the outstanding features of the

BELLOWS "Carbi-Drill" DRILL UNIT

- Capacity up to 5/8" diameter drill in mild steel.
- Runout will not exceed .001" T.I.R. in full 4" stroke.
- Depth accuracy .003" with standard limit switch; .001" with optional Bellows BT-1 Timed Dwell Control.
- Stroke adjustable from 1½" to 4", with optional stops to permit shorter stroke lengths. Thrust is equal to 10 times applied air pressure.
- Spindle speeds available from 609 RPM to 6275 RPM.

This rugged, heavy-duty drill unit is ideal for tool-room built special purpose machinery for drilling, tapping, reaming, counterboring, etc. It can be mounted in any position. Units can be easily synchronized electrically with each other or with other Bellows "Controlled-Air-Power" devices for fully automatic operation. Air-powered rapid advance, controlled hydraulic feed rate, air-powered rapid retract provide maximum speed with feed rate adjustable for any tool working in any material.

Take a quick rundown of the main features of this versatile "CARBI-DRILL" unit, then write for a copy of Bulletin CD-17, which gives complete details. Address Dept. **AM559**, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto 18.

1325-B

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

AKRON 9, OHIO

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

"Our new Bliss makes 16 of these a minute...

...direct from coil stock." Automating bearing cage production was a key objective of the modernization program recently undertaken by The Timken Roller Bearing Company. And close cooperation between Bliss transfer feed specialists and Timken production men resulted in a press that does the work of a number of older ones—it automatically feeds heavy gage coil stock in and finished cages out—sixteen of them every minute. If more parts for less money is your pressing problem then by all means send for our illustrated transfer feed bulletin. It's packed with some unusual applications of the transfer principle. Perhaps there's an idea here for you...

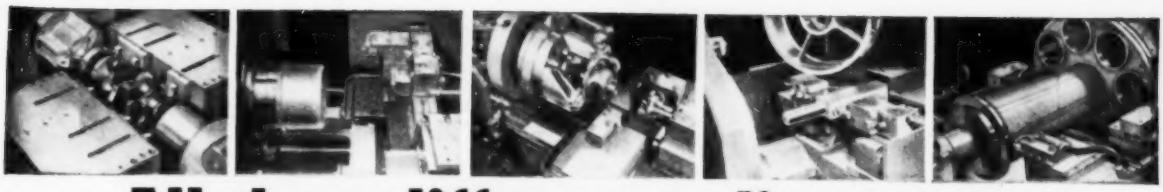
BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

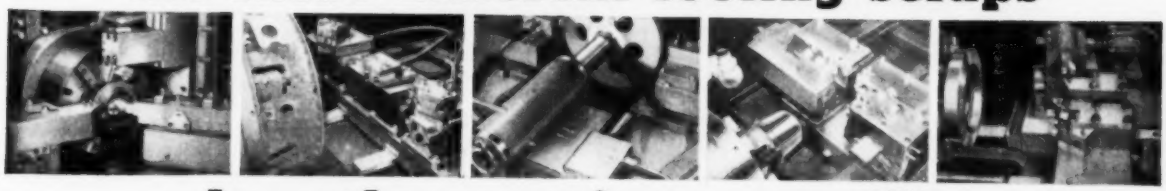
BLISS is more than a name—it's a guarantee

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

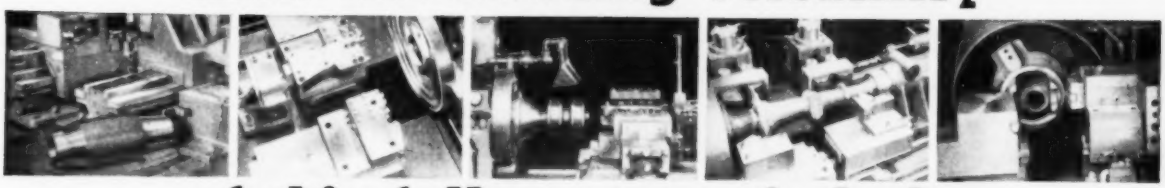
CIRCLE 216 READER SERVICE CARD



All these different tooling setups



show the amazing versatility



# of this fully automatic lathe

...the SIMPLIMATIC

Here's versatility that beats any automatic lathe you ever saw! Actually, the Simplimatic is doing hundreds of jobs like these—jobs that would otherwise be put on *special* machines—built at extra-special cost. But this (and don't miss the important point!) is a *standard machine*—at a *standard price.*

If you have medium or long runs on parts up to 36¼" in diameter, get the facts about the Simplimatic Automatic Lathe.

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin

THIS CATALOG may show you how the Simplimatic can save thousands of dollars for you as it is doing for many others. Write for your copy.

Gisholt Machine Co.
Madison 10, Wisconsin
Gentlemen:
Please send my copy of the Simplimatic Catalog.

Name.....*Title*.....
Company.....
Address.....
City.....*Zone*....*State*.....

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY-REBUILT MACHINES WITH NEW MACHINE GUARANTEE

...see how this new ROTOR PENCIL GRINDER excels all others

- **THE FIRST BLADED TYPE AIR-POWERED PENCIL GRINDER** . . . now vastly improved . . . the New Rotor M1223 D-03S. Features:
- **NEW FULL-GRIP COLLET.** "Rubberflex" collet grips shank entire ½" length. Takes wider range of shank tolerances. Holds shank concentrically . . . minimizes "runout" to .002", reducing vibration, prolonging point and cutter life.
- **FRONT EXHAUST** . . . away from operator. Keeps work clean. Collet shrouded by exhaust deflector. (Side exhaust optional.)
- **STURDIER CONSTRUCTION.** Rugged, one-piece spindle and ball bearings of ample size assure long life, smooth operation, reduced "runout". Splined drive of rotor to spindle is stronger, gives better dynamic balance.
- **MORE POWERFUL BLADED MOTOR** (not a turbine). Full 40,000 rpm gives plenty of power for ½" diameter mounted points and burrs, or cutters. Greater power under load for higher cutting efficiency.
- **TRY IT!**—ask for free demonstration of the New Rotor M1223 D-03S Pencil Grinder!

Optional end cap with side exhaust (arrow).

ROTOR TOOLS
CLEVELAND, OHIO

Here's the RIGHT TOOL for YOUR job!

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers • Special Tools • Air Motors
ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

CIRCLE 218 READER SERVICE CARD

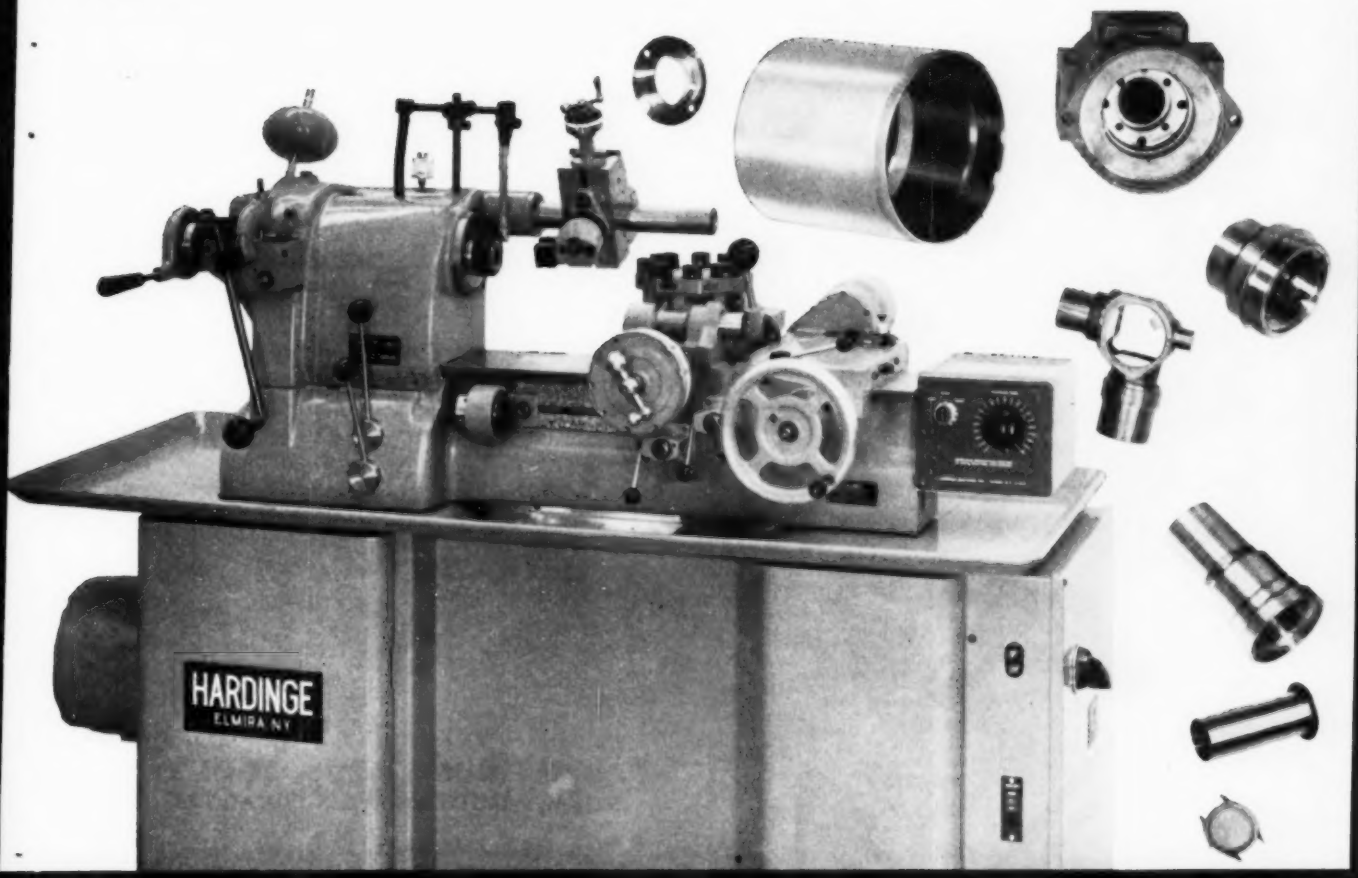
CIRCLE 219 READER SERVICE CARD ►

HARDINGE
ELMIRA, N.Y.

PRECISION CHUCKING MACHINE

Users say:

"We now get Production with Tool Room Accuracy"



Users enthusiastically tell us how they can easily maintain close tolerances, get better parts finish, and at the same time substantially cut costs . . . when they put Hardinge High Speed Precision Chucking Machines to work.

These results are possible because parts are finished in one setting with simplified tooling. All parts shown were produced with standard tool bits.

1 1/16" Collet Capacity— 6" Chucking Capacity— Write today for Bulletin HC-HCT which presents the whole story.

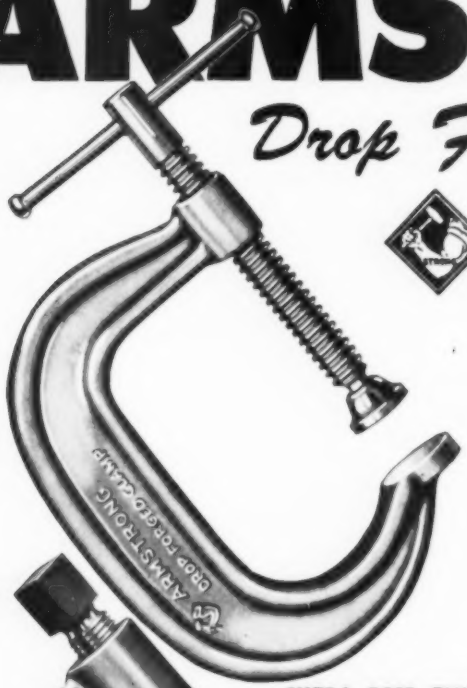
Offices in Principal Cities
Export Office: 269 Lafayette St., New York 12, New York

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

ARMSTRONG

Drop Forged CLAMPS



LEADERS IN THE DROP FORGED CLAMP FIELD

. . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

EXTRA DEEP THROAT "C" CLAMPS

Provide extra clearance required for some work. Extremely stiff for weight. Screws and hubs are accurately machined and aligned with machined seats; have sliding pin handles and free-acting swivel caps on point. Bodies have smooth sandblast finish.
(8 sizes to 12" opening)

Write for new ARMSTRONG General Catalog showing almost 5000 industrial tools.

ARMSTRONG BROS. TOOL CO.
5215 W. ARMSTRONG AVE. • CHICAGO 46, U.S.A.

HEAVY DUTY "C" CLAMPS

Universally recognized as strongest "C" clamps made. Longer hub holds screw alignment against terrific side strain; permit tighter clamping and multiplies thread friction against loosening. Extra large screws are heat treated and hardened at point.
(11 sizes to 12½" opening)

MEDIUM SERVICE "C" CLAMPS

The design and careful selection of steels in this type clamp combine to give it maximum strength and stiffness consistent with convenient weight. Heat treated screw with sliding pin handle and swivel cap on point. Ground seat.
(9 sizes to 18" opening)

TOOL MAKERS "C" CLAMPS

Quality steels, drop forged, heat treated and accurately machined with ground seats. Drop forged screws have both "wing nut" handle for convenience and square necks for tight setting with a wrench. Either "plain" or "swivel" screw types.
(Four sizes: 1", 2", 3" or 4" maximum opening)

SPATTER RESISTANT WELDERS "C" CLAMPS

Extra Deep Throat Pattern (see above). Body, Swivel and Screw are cadmium plated over all to resist welding spatter.
(8 sizes Capacities to 12" opening)

MACHINISTS' CLAMPS

Jaws drop forged, carefully machined and hardened, are extra heavy; will not bend or spring on a short bite and are faced true. Will grip non-parallel surfaces because the under face of the center screw is convex, fitting into a concave seat for tilting.
(Four sizes: Capacities to 4¼" opening)

PARALLEL CLAMPS

Carefully machined from selected grade steel and hardened. Particularly suited for holding work together when drilling or tapping. Rounded jaw ends increase clearance in close quarters. Spring clip holds loose pin in alignment while tightening or loosening.
(3 sizes: Capacities to 2½" opening).

This 24" floor model drill tailored for toolroom work includes Infispeed drive and 42" x 24" table.

Buy your new medium duty 16" or 24" CINCINNATI Sliding Head Drill just as you want it—with selected specialized equipment factory-installed and tested! Buy only the cost-saving combination you need to suit your toolroom, production or job shop requirements EXACTLY!

NEW BACK-GEAR SPINDLE DRIVE

7½ to 1 ratio Back-Gear—12 spindle speeds with Standard drive, infinite selection with Infispeed. Full torque over entire 60—3000 RPM range. Controls at front of machine.

INFISPEED VARIABLE SPEED DRIVE

Provides exact spindle speed for each job. Indispensable for operations requiring frequent spindle speed changes.

NEW BUILT-IN ELECTRICAL TAPPING ATTACHMENT

Manual tap reversal by hand feed lever; automatic reversal by deptn stop.

NEW PRECISION DEPTH STOP

Direct-reading dial permits quick settings to .005". Positive stop for sensitive hand feed; automatic disengagement when used with new "torque-load" power feed precision controlled to .005".

OTHER COMBINATIONS include Geared and Air Power Feeds, Manual and Automatic Work Holding Fixtures, Wide Selection of Plain or T-Slotted Work Tables, Variety of Spindle Types and Sizes, Motor Driven Coolant Pump, and other Cost-Reducing Attachments.

See your CL&T Dealer, or write us direct.

Improved Machining Through Research

CINCINNATI LATHE AND TOOL CO.

3207 Disney Street • Cincinnati 9, Ohio

"TRAY-TOP" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners

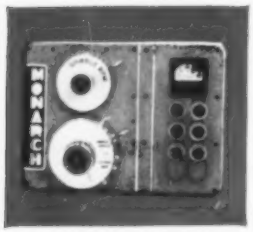
the Monarch gage for

How do your lathes measure up? You get what you pay for in the purchase of a lathe, as with anything else. Greater production, therefore lowered costs, is the major reason for acquiring a new machine. That's what you get in the Monarch Series 62 Dyna-Shift—the only lathe of its general type which can be kept under full load during the entire machining cycle. Major contributing factors design-wise are more machine output per unit of power input, less operator effort, reduced maintenance and ease of supervision. See for yourself why the Series 62 meets all these requirements as does no other lathe on the market.

Users have found that these features and advantages have translated themselves into production increases of 25% or more and tool life improvement up to as much as 50%. And that's the pay-off. When you are ready to invest in a new lathe, buy the best. It's the cheapest in the long run.

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

THE HEADSTOCK THAT THINKS... AND REMEMBERS



1. 36 speeds—range 14 to 1750 R.P.M.—ratio 1 to 125. Standard range low enough, high enough and with plenty of speeds in between to provide reasonably constant surface cutting speed on most work.

2. Optional extra-high speed range of 25 to 2500 R.P.M. available for free cutting metals such as aluminum and for ceramic tooling requirements.

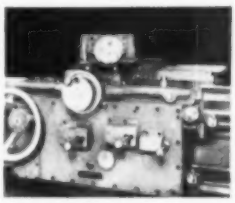
3. Operator works in terms of surface cutting speed. Machine automatically figures correct R.P.M. and sets up shift. Operator sets two large dials—one for work diameter, the other for desired surface speed.

4. Using the two-dial preselector, up to six or more different speed changes may be preset while machine is under cut. This saves speed change time when turning successive diameters having considerable variation or when finish turning immediately follows rough turning. The second dial always indicates spindle speed in engagement.

5. Pull of knob gives free spindle in a jiffy. And there is a generous $2\frac{1}{16}$" hole through the spindle.

6. Hydraulic brake and clutch are self-adjusting for wear. Being under automatic machine control regardless of load, operator need not supply power for engagement.

THE CONTROL CENTER OPERATORS LIKE



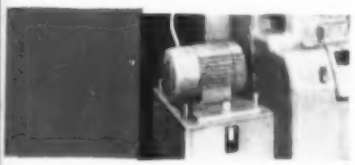
1. Series 62 is controlled by a three-position lever at the apron. A duplicate lever close to the headstock is provided for setup purposes. With it, work rotation may be started or stopped, jogging or speed change may be accomplished. In the SPEED CHANGE position the next speed is engaged automatically when preselection is used.

2. Shifting (an operation performed many times each day) is at finger-touch ease and speed. Hydraulic power does the work of clutching, braking, shifting and jogging.

3. Four-way power rapid traverse is in-built. Both carriage and cross slide traverse may be engaged simultaneously. This saves as much as 50% in tool adjust time.

4. Positive cam controlled feed frictions. Application is such that machine never loses its chip under heavy cuts.

5. Apron or headstock controlled leadscrew reverse, the former a must when much thread chasing is done.



ELECTRICALS WHERE THEY SHOULD BE

1. External main drive motor mounting and external electrical control mounting (either NEMA or JIC) for quick accessibility.

2. Motor mounted on hydraulic system sump from which position it also supplies power for hydraulic pump.

COMPLETE AUTOMATIC LUBRICATION

1. Headstock, end gearing and gear box served by single system of the filtered, combination mist-splash type.

2. Apron lubrication system of the circuited, metered and filtered type also provides oil to carriage guide ways and cross slide bearings.

3. Tailstock has its own lubrication system.

INTERLOCKS FOR SAFETY

1. When machine is started, the brake engages automatically, preventing spindle rotation regardless of main control lever position.

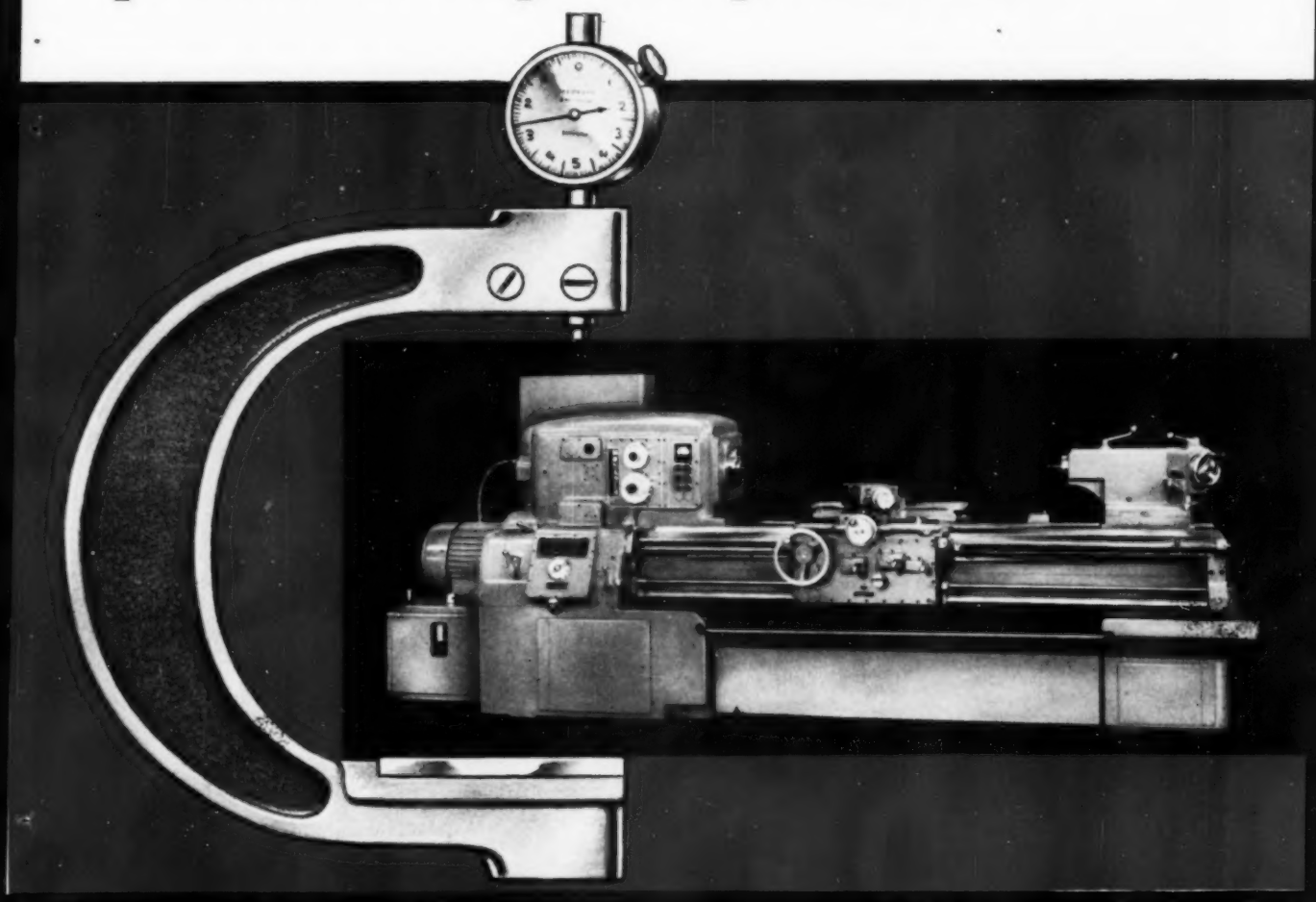
2. No speed shift can be made with spindle rotating. More than anything else this preserves the original accuracy of headstock gearing.

3. Leadscrew and feed rod cannot be engaged simultaneously; neither can feed and power rapid traverse.

4. Leadscrew reverse cannot be engaged with spindle rotating above 340 R.P.M.

CIRCLE 222 READER SERVICE CARD

series 62 lathe–
productivity and precision



PROTECTED GEAR BOX AND END GEARING

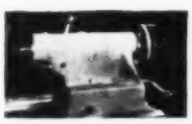
1. Gear box and end gearing totally enclosed. Lubrication is kept in, dirt kept out, original accuracy maintained.

THE BED...A FIRM FOUNDATION

1. All four bed ways flame hardened and precision ground to keep them factory-fresh for years to come.
2. Generous size chip pans are designed for easy chip removal at front or rear.
3. Longer machines equipped with traveling rod supports which are automatically picked up and dropped off by apron.

TAILSTOCK THAT MEANS BUSINESS

1. Either single speed or two speed range type available with dead or anti-friction center spindle. Sufficient mass and rigidity to support the heaviest of cuts.
2. Movement along bed manually or by power. This combination satisfies all turning conditions.



SUPERVISORY PROBLEMS SIMPLIFIED

1. At a quick glance, supervisor may check (a) work diameter setting, (b) SFPM setting and (c) H.P. consumption. This makes it possible easily and quickly for him to assure full productiveness of machine and operator at all times.

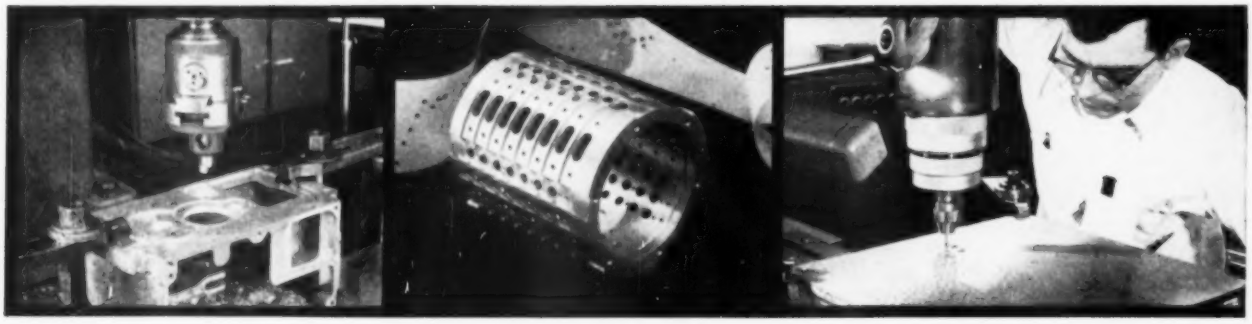
ADDED EQUIPMENT FOR ADDED PRODUCTION

1. Additional equipment in vast variety is available for the Series 62 line. Consider, by all means, the advantages of the "Air-Gage Tracer," a means by which thousands of users have reduced costs substantially.
2. Ask for descriptive booklet No. 1506 which not only describes the basic machine but the commonly used items of additional equipment. It includes full specifications.

Monarch
TURNING MACHINES

CIRCLE 223 READER SERVICE CARD

ACCURACY



MACHINING TIME WAS CUT 50% for 10-piece lots of these gear boxes, by changing from manual to tape control. Locations made automatically under tape control are accurate to .0001".

30-HOUR JOB DONE IN 7½, when this precision computer part was machined under Numerical Control. This job involved precision machining at 566 separate locations.

1429 HOLES WITHOUT ERROR, an almost impossible job under manual operation, was completed under Pratt & Whitney Numerical Control with estimated time savings of 41%.

ASSURED...

"P&W NUMERICAL CONTROL HAS PROVED IT WILL IMPROVE **MACHINE UTILIZATION*** 100% AND ELIMINATE ERRORS," says "Jake" Jaeger

**(Time spent cutting metal)*

Mr. J. J. ("Jake") Jaeger, Vice President and Chief Engineer of Pratt & Whitney's Machine Tool Division, states, "Reports from more than 35 successful installations in the field and experience in our own manufacturing conclusively prove that P&W Jig Borers with Numerical Control represent a truly significant advance in metalworking. Users, which include both the giant corporations and shops with less than 10 men, are realizing time savings from 2-to-1 to 6-to-1 – depending on the complexity of the parts – and in addition have improved their MACHINE UTILIZATION time 100%. With this great increase in productivity, the jig borer has truly become a production machine. Used, for example, in our own manufacturing of components, the need for expensive jigs is eliminated, engineering changes are simple and inexpensive – and every production part has the toolroom precision of an original jig.

ADDITIONAL ECONOMIES THROUGH SCRAP ELIMINATION . . .

"With all machine positioning made automatically under Numerical Control, scrap losses from human errors in positioning are eliminated. Freed from blueprint calculating, the operator can concentrate on his primary job – making chips. The result is more and better work, with less fatigue.

VERSATILITY UNLIMITED

"The P&W Jig Borer has also proved that it can handle efficiently and economically an almost unlimited variety of jobs – one-piece jobs, extremely complex jobs, or lot production – in fact, any job that requires drilling, reaming, tapping or boring holes, or milling slots or surfaces."

Summing up the importance of Numerical Control, "Jake" Jaeger continues, "No one can *afford* to overlook the ability of this equipment to increase machine tool utilization and effect economies in his own operations." Experience has proved the truth of this statement, so act today to get all the facts on P&W Numerical Control. Write now for your free copy of Circular No. 609. Pratt & Whitney Company, Inc., 11 Charter Oak Boulevard, West Hartford, Conn.

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

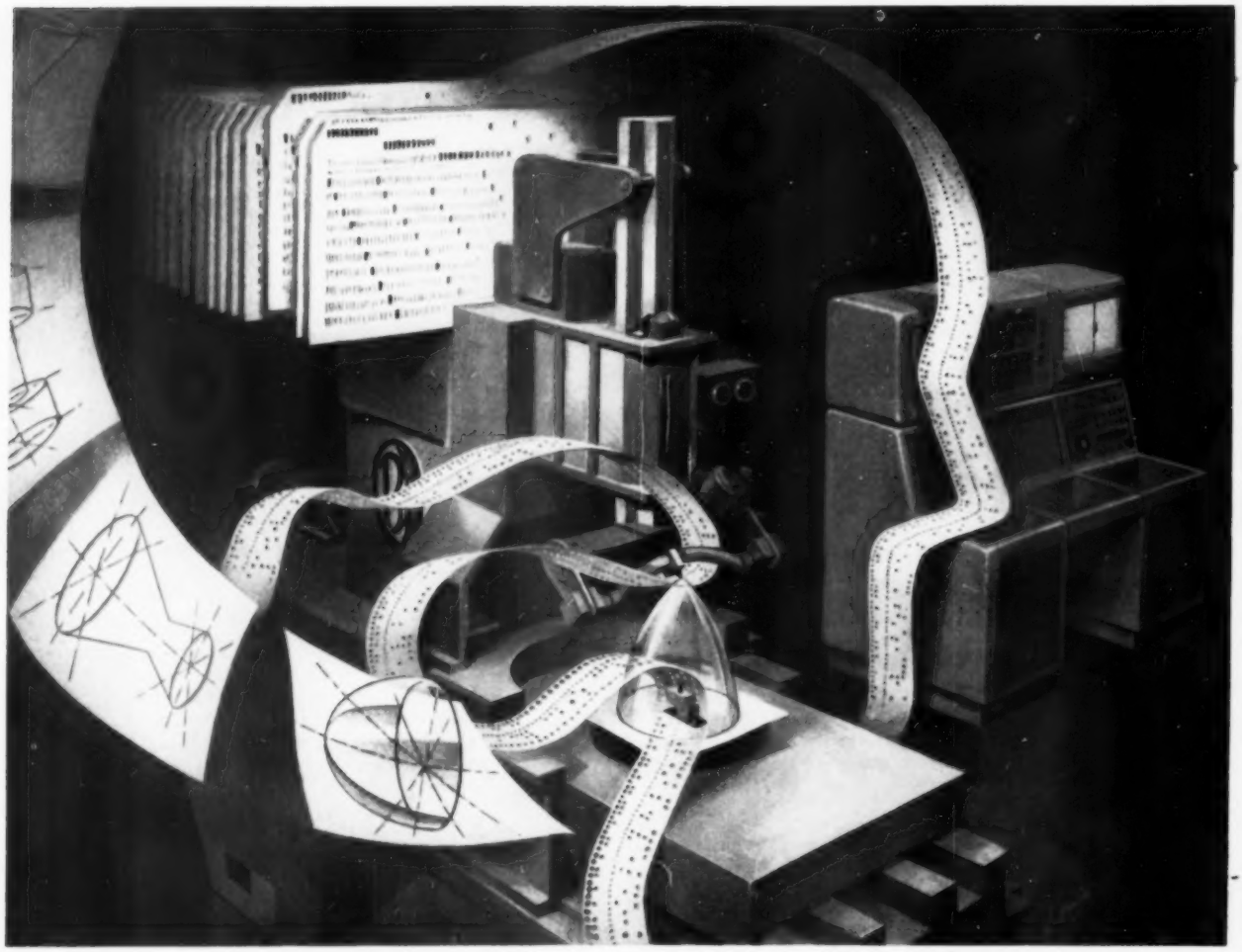
MACHINE TOOLS • GAGES • CUTTING TOOLS

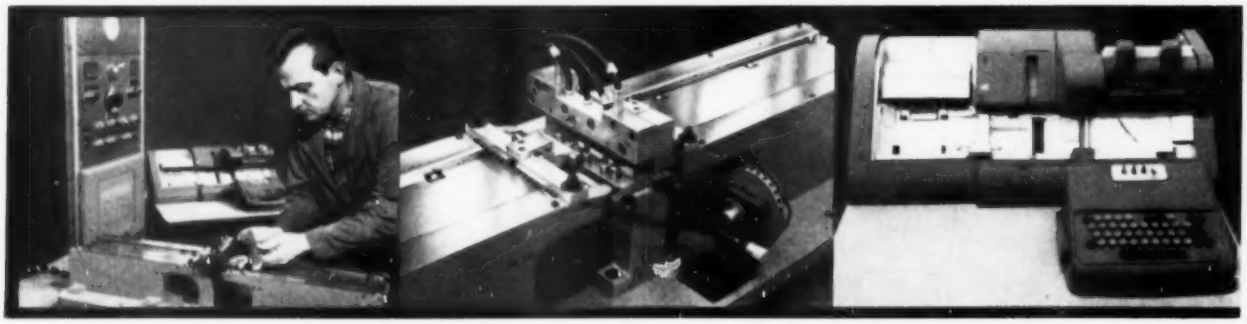
AUTOMATICALLY POSITIONING WORK ACCURATE TO .0001", the P&W Numerically Controlled Jig Borer combines toolroom precision with production-line speed and economy.

SETTINGS ACCURATE TO 5 SECONDS OF ARC are made automatically by the P&W Rotary Table with Numerical Control. Automatic positioning speeds work, eliminates human errors.

PROFILE MILLING ENTIRELY UNDER TAPE CONTROL, the P&W Numeric-Keller produces irregular shapes without the need for any template or model. Accuracy is unusually high.

ACCURACY





405 SEPARATE MEASUREMENTS ARE CHECKED AND DATA PROCESSED . . . by this Pratt & Whitney Gage with "Data-Limit" digital readout. The workpiece is a precision part for a nuclear reactor. In operation, a cross section is gaged at 9 separate points, the piece moves forward a pre-determined distance, and the multi-dimensional check is repeated. In all, 45 cross sections—involving 405 separate dimensions—are checked. Digitized data readout is used to "remember" individual measurements, compute the average cross section and, finally, to print on an IBM card a complete visual record of all dimensions and computations. Except for placing the workpiece in the gaging member, operation is completely automatic.

ASSURED...

NEW "DATA-LIMIT" GAGING CONCEPTS CAN SMASH YOUR MULTI-INSPECTION BOTTLENECKS and REVOLUTIONIZE YOUR QUALITY CONTROL METHODS

Applying the techniques of numerical control and digital readout to inspection operations, Pratt & Whitney offers DATA-LIMIT . . . a new concept in gaging. This new development can help you speed up multi-dimension inspection for complicated parts to keep pace with the increased output of automated production machines. It can "remember" or process gage data . . . instantly compute tapers, fits, wall thicknesses or other dimensional interrelationships . . . control automatic sorting or classifying for selective assembly . . . or provide a complete quality control record using any desired type of printed form.

For example, numerically controlled P&W Measuring Machines, with information supplied by punched tape, automatically check hundreds of coordinate points on inner or outer surfaces of complex parts . . . including missile shapes and similar components. Digital readout systems applied to these measuring machines, and to other P&W Gages, are helping manufacturers speed gaging, reduce inspection costs, eliminate human errors, reduce inventories where selective assembly is required, and improve product precision and performance by providing more complete records of dimensional data.

To eliminate gage bottlenecks and insure continued progress and profit, your inspection methods must advance with your production equipment . . . and this calls for Pratt & Whitney's DATA-LIMIT . . . the new concept that applies modern numerical and digital techniques to gaging. If more complete dimensional information about your components . . . and faster processing of this data . . . can help you streamline inspection procedures, Pratt & Whitney can engineer a complete system to do the job. For more complete information, write for your copy of **Circular No. 627. Better still,** make arrangements now to have a P&W Gage Team visit your plant, analyze your needs, and recommend a truly modern inspection system. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Conn.

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

AIR-O-LIMIT COMPARATORS . . . are one of the many P&W gaging methods available to you. Unusually versatile, these gages are easily adapted to check an unlimited variety of parts with speed and accuracy.

P&W SIGMATIC MULTI-GAGING MACHINES . . . help break gaging bottlenecks by simultaneously checking up to 50 dimensions with speed and accuracy. Interchangeable gage tooling permits fast, easy change-over.

P&W TRANS-O-LIMIT COMPARATORS . . . offer outstanding circuit stability, extreme versatility, and gaging pressures less than 1 ounce. Reads in thousandths, ten-thousandths and millionths.

STANDARD BROACHES from STOCK

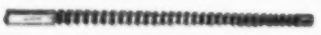
Minute Man

KEYWAY BROACH KIT

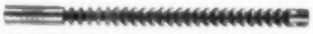
In one minute and for as little as one cent you can cut a keyway with the Minute Man Keyway Broach Kit. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

SAVE TIME AND MONEY WITH THESE OTHER STANDARD STOCK BROACHES

SQUARE BROACHES — 1/8" to 3/4" holes



HEXAGON BROACHES — 1/8" to 3/4" holes



ROUND BROACHES — 1/4" to 1" holes

SEND FOR CATALOG AND PRICE LIST

The duMont Corp.
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name .....

Company .....

Address .....

duMont

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

More on hearing

Dear Sirs:

Your readers may receive an erroneous conception of what constitutes a satisfactory hearing conservation program because the article "Hearing Losses: They May Cost You Money" (*AM*—Feb 23 '59, p116) was edited down from the original manuscript.

Four points toward the end of the article covered pre-employment examination, qualified personnel, dependable pure-tone equipment, and the environment. The original manuscript called this fourth point a factor of extreme importance . . . "the testing environment. One of the great advantages of using the pure tone audiometer is that it provides a set of controlled conditions. But without a controlled environment in which to give the test, the test itself may be meaningless to:

1. A physician trying to interpret results.
2. A court seeking to establish facts in connection with a suit.

In most cases it is more convenient to conduct the audiometric tests on the premises if they are to be part of the pre-employment physical examination, and if they are to be given regularly.

Until recently the prescription has been simply to use a quiet room with a relatively low constant noise level. However, prefabricated audiometric testing rooms are recommended as part of conservation programs because they provide quiet, controlled atmospheres in which audiometric tests may be accurately administered."

In view of the fact that this fourth point was edited to provide a possible area of erroneous implication, I think you should print a copy of this letter in order to correct the misinterpretations that may possibly have been made by your readers.

Ellis E. Singer
Clinical Audiologist
New York, NY

The article that appeared in print said, "Specially built audiometric rooms are recommended to establish a controlled environment, but

SHOPMATES

N. Jarvis

I'LL HAVE YOUR BRACELET FIXED IN A SECOND SWEETIE .... I DID IT EXTRA SPECIAL .... JUST FOR LITTLE YOU!!
AIN'T IT SICKENING!! MAC LOBO ALWAYS FIXIN' STUFF FOR THE GALS?? HOW KIN HE TELL WHO OWNS WHICH PIECE OF JUNK??
IT'S CHEAPER FER THE COMPANY TO KEEP A GUY LIKE HIM AROUND THAN IT IS FER THE GALS TO BE PESTERIN' THE REST OF US ALL THE TIME!!
N. JARVIS

This "SPECIALIZED" Leland-Gifford

DRILLS DEEP HOLES IN DIE CASTINGS

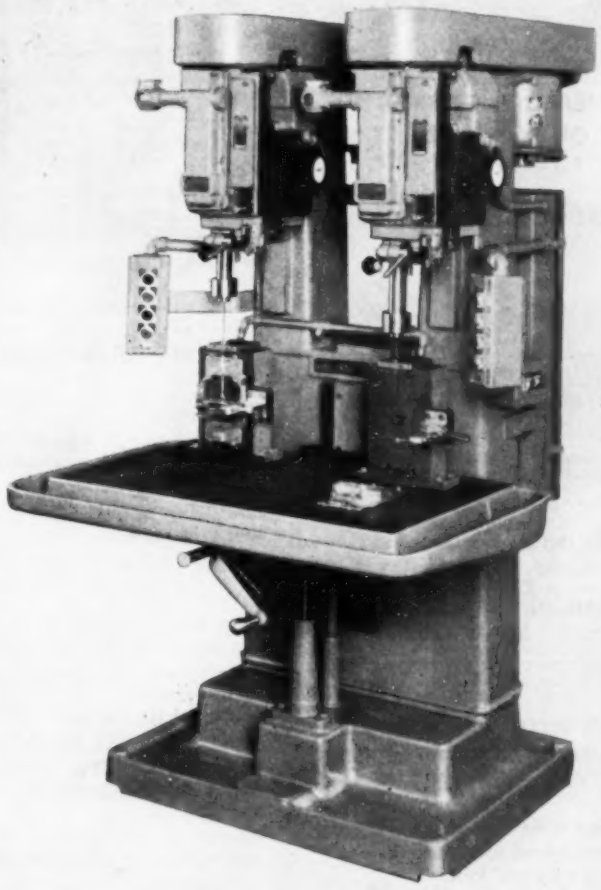
at 250 pieces per hour

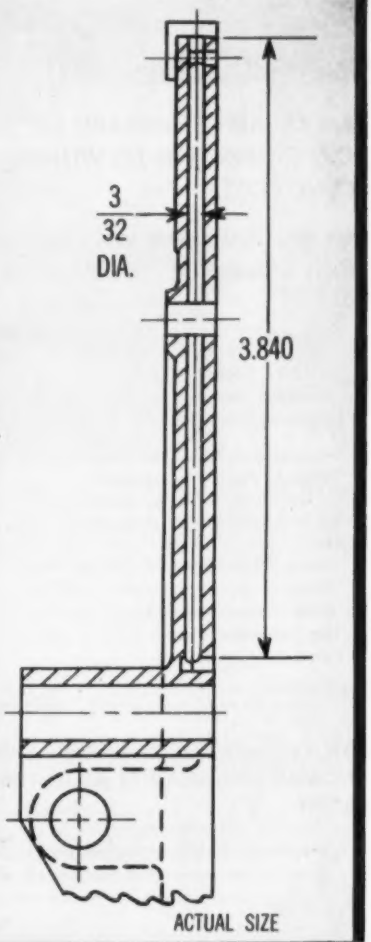
Small diameter deep holes . . . drilled to precise depth to meet an existing cross hole . . . through thin sections of die cast aluminum — this is a job on which you would settle for accuracy and not expect quantity production. But Leland-Gifford developed this two-spindle drilling machine that delivers both performance *and* production . . . proving once again that you never know how effectively a drilling problem can be solved until you talk to Leland-Gifford.

DO IT RIGHT and DO IT FAST...

Two self-contained drilling units are mounted on a standard pedestal over twin work-holding fixtures. Hydraulic feed with step by step control assures fast, automatic drilling to accurate depth and dimension.

Call in your nearby Leland-Gifford sales engineer.





LELAND-GIFFORD SPECIAL DRILLING MACHINES

WORCESTER 1, MASSACHUSETTS
U. S. A.

Chicago 45
2515 W. Peterson Ave.

Detroit
10429 W. McNichols Rd.

Cleveland 22
P. O. Box 853

New York Office
75 S. Orange Ave.
South Orange, N.J.

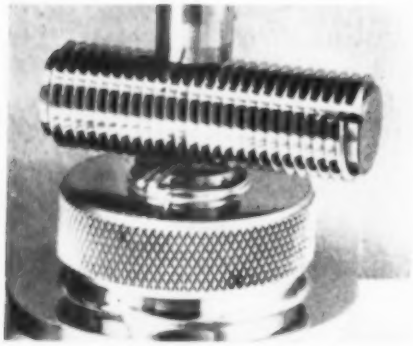
Los Angeles Office
2620 Leonis Blvd.
Vernon 58, Cal.

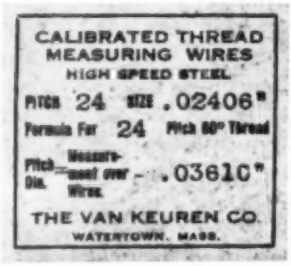
Indianapolis 6, P. O. Box 1051

Rochester 12, P. O. Box 24, Charlotte Station

WHY YOU NEED VK CALIBRATED THREAD WIRES

39th YEAR





VAN KEUREN STANDARD 60° THREAD MEASURING WIRES ARE NOW CALIBRATED TO WITHIN .000005" OF EXACT SIZE AT NO EXTRA COST.

THIS PREVENTS THE LOSS OF SUBSTANTIAL PORTIONS OF YOUR PITCH DIAMETER TOLERANCES.

CONSIDER

With VK *Calibrated* Wires:
Maximum deviation in wire size as shown on label = .000005"

Maximum error in measurement of 60° Threads due to wire deviation
= .000005" x 3*
= .000015"

For a 3/8-24, Class W, Thread Gage the pitch diameter tolerance is .0001". Thus maximum measurement error using *calibrated* wires is 15% of pitch diameter tolerance.

With *Uncalibrated* Wires:
Maximum deviation in wire size as shown on label = .000025"

Maximum error in measurement due to wire deviation
= .000025" x 3*
= .000075"

Note here that the error in measured pitch diameter using *uncalibrated* wires could be 75% of the total tolerance allowed for the pitch diameter of the 3/8-24, Class W, Thread.

**Change in Measurement for 60° threads = Change in Wire Diameter x (1 + cosec 30°)*

CAN YOU AFFORD TO GAMBLE PART OF YOUR PITCH DIAMETER TOLERANCE ON UNCERTAINTY AS TO THE TRUE DIAMETER OF THE MEASURING WIRES?

Wouldn't it be a good idea to send us your uncalibrated or worn thread measuring wires for calibration and replacement where necessary? Liberal allowance will be made on uncalibrated wires toward the purchase of new calibrated wires.

VK

THE Van Keuren CO.
Since 1920
173 Waltham Street, Watertown 72, Mass.
PRECISION MEASURING TOOLS
. . . rated the world's most accurate
Plug Gages · Measuring Wires · Optical Flats and Light Wave Equipment · Gage Blocks · Precision Lapping Service and Parts

a quiet room may suffice unless a physician seeks quantitive results or if legal evidence is required."

We believe this to be technically correct but agree with Author Singer when he says a wrong implication may be detected. The emphasis should be on the audiometric testing room—and a photo of a typical testing room is included here to show what they look like—Ed.

Electrostatic chuck

Dear Sirs:
Would you please advise me where I may obtain additional information on electrostatic chucks for non-magnetic work (*AM*—Feb 9 '59, p91)?

George Panosian
Detroit, Mich

Dear Sirs:
We are old readers of your magazine and are very much interested in the article. . .

We would be very pleased if you could kindly let us have the name and address of the firm which manufactures the electrostatic chuck.

J Arts
Brussels, Belgium

Dear Sirs:
Please send me information on Electroforce chuck and components. . .

William Trotter
Mountain View, Calif

The chuck is manufactured by Electroforce, Inc, 75 North Pine Creek Road, Fairfield, Conn, Mr Robert W Waring, President—Ed.

CALENDAR

National Institute for Disaster Mobilization — National Industrial Mutual Aid Conference, May 10-12, Bellemont Motor Hotel, Baton Rouge, La.

American Institute of Electrical Engineers — Automatic Techniques Conference, May 11-13, Pick-Congress Hotel, Chicago.

American Society of Mechanical Engineers — Production Engineering Conference, May 12-14, Statler-Hilton Hotel, Detroit, Mich.

Machinery Dealers National Association — Annual Convention, May 13-15, Plaza Hotel, New York, NY

American Supply & Machinery Manufacturers Association — Triple Industrial Supply Convention, May 13-15, Dallas.

American Institute of Industrial Engineers — National Conference and Convention, May 14-16, Biltmore Hotel, Atlanta, Ga.

Magnesium Association — Annual Meeting, May 18-19, The Cloisters, Sea Island, Ga.

Design Engineering Show — May 25-28, Convention Hall, Philadelphia, Penna.

American Society for Quality Control — National Convention and Exposition, May 25-27, Public Auditorium and Hotel Cleveland, Cleveland, Ohio.

American Gear Manufacturers Association — Annual Meeting, May 31-June 3, The Homestead, Hot Springs, Va.

Material Handling Institute — National Exposition, June 9-12, Public Auditorium, Cleveland.

National Association of Metal Finishers—Annual Meeting and Convention, June 14-16, Statler-Hilton Hotel, Detroit, Mich.

American Society of Mechanical Engineers—Semi-Annual Meeting, June 14-18, Chase-Park Plaza Hotel, St. Louis, Mo.

Society of Automotive Engineers — Summer Meeting, June 14-19, Chalfonte-Haddon Hall, Atlantic City, NJ.

Now...B & S Offers 20% Savings on 80% of End Mill Applications!

Thriftmill *Brings "Throw Away" Tool Concept to End Mill Operations!*

Why is the initial price of the NEW B & S Thriftmill 15 to 20% less than conventional end mills at a time when most other metal-working costs are rising?

This is a new exclusive design, a product of B & S progressive engineering and manufacturing techniques. The Thriftmill can be produced faster, more efficiently and therefore costs less.

Demand for the new Thriftmill is so phenomenal—large volume production lowers manufacturing and distribution costs.

Shop tested on profiling, slotting, peripheral milling and many other general end milling operations, the Thriftmill excels in over 80% of production applications. The new Thriftmill may mean new end milling economy and efficiency for you.

Ask your Distributor about the New B & S Thriftmill today! Send for new CONDENSALOG —easy to use specifications and prices on over 3300 "standard" cutters and end mills to: *Cutting Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.*

FOR THAT EXTRA EDGE IN PRODUCTION

Brown & Sharpe

CUTTING TOOL DIVISION

HIGH SPEED STEEL CUTTERS
NELCO CARBIDE TOOLS
END MILLS

PROGRESS IN PRECISION FOR OVER 125 YEARS

A PRODUCT OF SKILL

BUTTERFIELD
100%
INSPECTED
TOOLS

the complete line

Butterfield drills, reamers, taps, dies, counterbores, cutters, end mills, hobs and carbide tools are craftsmanship-produced and are delivered rapidly anywhere. Warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York and San Francisco. **Call your Butterfield Distributor.**

BUTTERFIELD

BUTTERFIELD DIVISION, UNION TWIST DRILL COMPANY, DERBY LINE, VERMONT

CIRCLE 232 READER SERVICE CARD

CIRCLE 233 READER SERVICE CARD ►

METALITE

Where Quality Scores Production Soars...

Metalite Cloth is Manufactured solely by . . .

BEHR-MANNING CO.
TROY NEW YORK
A DIVISION OF NORTON COMPANY
NORTON ABRASIVES

YOU NAME IT

THEY HAVE IT

Fast-cutting · Flexibility · Safety · Economy · Sharpness · Toughness

Speed-wet Metalite (GREEN-BAK) Fibre Discs

A grit 24 Metalite disc mounted on an air portable tool is removing welds from the top radius of steel washer tubs. A steel disc pad is used to back up the grinding disc.

Draw marks on the top side of this steel cooking well are being smoothed with a Metalite fibre disc mounted on a portable grinder and running at 5000 rpm.

BEHR-MANNING CO.

TROY, NEW YORK

A DIVISION OF NORTON COMPANY

ABRASIVES®

BEHR-MANNING PRODUCTS: Coated Abrasives · Sharpening Stones · Pressure-Sensitive Tapes
NORTON PRODUCTS: Abrasives · Grinding Wheels · Grinding Machines · Refractories · Electrochemicals
In Canada: Behr-Manning (Canada) Ltd., Brantford. For Export: Norton Behr-Manning Overseas Inc., Troy, N. Y., U.S.A.

SPOT NEWS...

- **Ford will name its forthcoming small car the "Falcon,"** will offer it in sedan and station wagon form.

- **Russian machine tool production is running ahead of quotas** for the first three months of its ambitious Seven-Year Plan. Some 34,000 units have been turned out during the period—a 6% gain over corresponding 1958. Overall Russian metalworking production rose 13% over comparable first quarter 1958, but auto output dropped 6% in the same period.

- **What machine tools are and what they do for mankind** are explained in a new 16-mm, 27-minute sound-and-color film, "One Hoe for Kalabo," just completed by the National Machine Tool Builders' Association. Film may be obtained for showing after June 1 by writing to Modern Talking Picture Service Inc, 3 East 54th St, New York City, 22.

- **Latest entry in the burgeoning electric car field:** Two models planned for mid-1960 production at a rate of 500 a year by Lansing, Mich's Nu-Way Industries Inc. One will be an 86-in.-wheelbase, 2-passenger roadster: the other a 4-passenger sedan on the same chassis. Both will be plastic-bodied, have 4 hp, will have a top speed of about 45 mph.

- **Considerable European steel is reported being delivered to New England** and East Coast users. Inland Steel is worried about possible influx of foreign steel into Chicago when the St Lawrence Seaway opens this month.

- **New rubber mold material for plastic models vulcanizes without heat.** RTV, developed by GE, can also be used to reproduce broken machine parts by using the part as a pattern from which a mold can be made. Mold is then used to cast an epoxy replacement—all within a few hours.

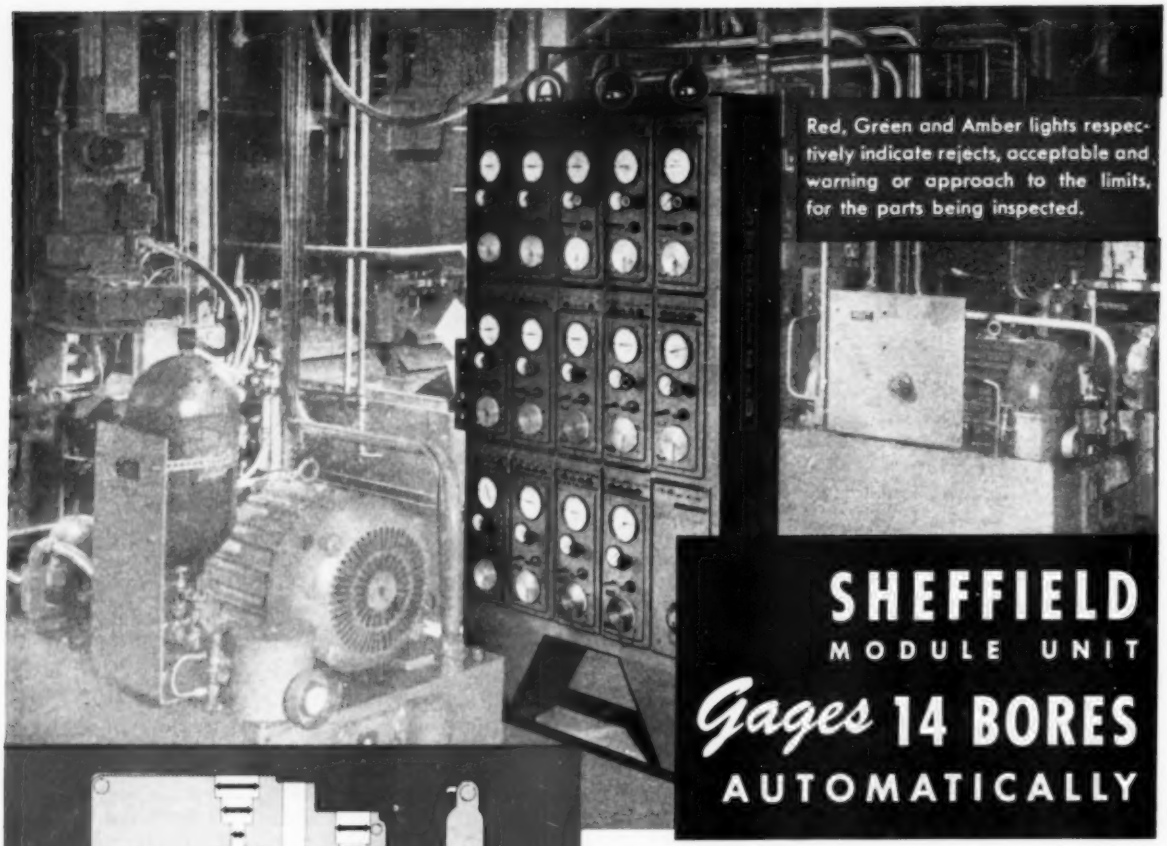
- **Increased productivity as a means of licking inflation** is being investigated by Congress's Joint Economic Committee ,head by Staff Director Otto Eckstein, who is on record in favor of variable depreciation allowances to permit larger write-offs during business declines as a stimulant to investment. But this would also mean reducing depreciation allowances in boom times. Idea now is to smooth out capital spending ups and downs.

- **Manufacture of compressor blades for jet engines will be discontinued** by Eaton Mfg Co, Cleveland, after present commitments have been fulfilled late this year. Eaton, one of the four major U S blade producers, gives as its reason the steady curtailment of military orders.

- **E W Bliss Co and Henschel-Werke GmbH, Kassel, Germany,** have formed Bliss-Henschel with headquarters at Dusseldorf. Owned 75% by Bliss, Bliss-Henschel will sell Bliss mechanical and hydraulic presses and all other Bliss products which will be made in Henschel Werke's three plants at Kassel. Bliss by this action expects to be a strong factor in Western Europe, Latin America and Asia and to be able eventually to offer a more complete service to Common Market countries than is possible from the two Bliss plants in Europe—one at Derby, England, and the other at St Ouen sur Seine, France. Henschel makes a wide range of heavy-duty equipment, employs 10,000.

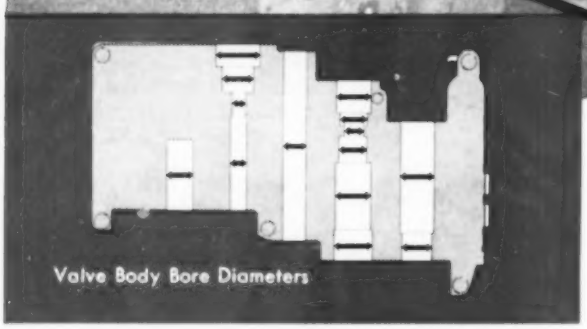
- **Industrial productivity (output per man hour) declined 5% in 1958,** according to the Bureau of Labor Statistics. But BLS also anticipates at least an 11% jump this year, now that the recession is over.

- **Union move to limit selection of subcontractors** to those who pay union wages and fringe benefits has touched off a strike idling 200 metalworkers as California Metal Trades Association member firms objected to the move as an infringement of management's basic rights.



Red, Green and Amber lights respectively indicate rejects, acceptable and warning or approach to the limits, for the parts being inspected.

SHEFFIELD MODULE UNIT *Gages* 14 BORES AUTOMATICALLY



Valve Body Bore Diameters

Transmission valve bodies directly from the boring machines are conveyed to gaging position. Air gaging spindles enter simultaneously to explore the dimensional fitness of each bore and to detect any possible obstruction such as a broken tool fragment.

The results of the pneumatic check are transformed into visual signals and electrical impulses—the latter for use in the automatic control of the boring machines.

Quicker, More Convenient to Adjust

The compact mounting panel carries an individual Sheffield Modulaire* for each dimension gaged. All adjusting elements and controls including the air pressure gage and visual indicator are right on the front of each Modulaire unit where they are most accessible and visible.

*Trademark

Servicing Greatly Simplified

Each Modulaire is a self-contained unit which may be slipped out of the assembly and replaced without interfering with other units of the assembly.

Each group of Modules is provided with a Sheffield Monitorecord Circuit for quickly checking the time cycles of the gaging functions. This is an integral part of every Sheffield Automatic Control System.

Longer Tool Service Life

Sheffield air gage spindles are designed with greater hole clearance to minimize wear. They float for slight differences in bore location and thus further extend service life.

Not Confined to Air Gaging

The sensing units of Sheffield automatic gages may also be electronic, electrical or mechanical as well as pneumatic. The choice depends on individual requirements or restrictions. Sheffield builds gages of all types as well as data handling systems.

8194

When you are considering an installation of this type, call a Sheffield engineer. His recommendations need not be biased. Or write the Sheffield Corporation, Dayton 1, Ohio, U.S.A. Dept. I.

the SHEFFIELD corporation
of Bendix Aviation

manufacture and measurement for mankind

WASHINGTON...

Radioisotopes for metalworking . . .

Growing use of radiosotopes in metalworking—replacing X-ray devices for radiographic work, for example—is reported in a new study made for AEC. It reports that 18 major industries have recorded annual savings of $39.2 million as a result of the switch. If intangible or indirect benefits are also taken into account, the savings are even higher.

Largest savings are realized from nuclear gages, widely used in continuous process industries such as steel and non-ferrous metals. Isotopes are replacing the X-ray devices, the researchers say, because the isotope devices are more portable.

Despite the high return on investment in industrial isotope facilities, however, NICB concludes that "Only a small percentage of American industrial companies are availing themselves of the opportunity."

No surplus copper disposals?

Washington is likely to kill off its plan to release some of its surplus copper inventories after the scare this produced in international copper markets in New York and London.

When rumors of the government plan began to leak out, smelter prices dipped to a new 31.5¢ low since copper prices started strengthening some months back. Washington will apparently back down now as the result of pressure from mining state Senators and other sources.

Guaranteed discount rail rates . . .

Interstate Commerce Commission has begun a probe into the controversial issue of guaranteed discount rate systems for U S railroads. The Commission wants more time to study the question before deciding whether to introduce guaranteed rates here similar to those in effect in Canada and Great Britain.

Under such a system, railroads would grant a special discount rate to large shippers who agree to move annually the major share of their business by rail.

ICC started the study after it flagged down the Soo line from introducing the first U S guaranted rates on shipments of iron and steel pipe and tubing from Sault Ste Marie to Chicago. The Soo proposal whipped up protests from truckers and barge operators. They argued the new plan would undermine the present U S rate system, scuttle some of their business.

The critics have succeeded in delaying for about a year any decision on the matter. ICC's investigation will last seven months, during which time it will get testimony and hold public hearings. After that, it will take more time to consider the evidence and hand down a decision.

NASA patent restrictions . . .

The National Aeronautics & Space Administration is studying a plan to liberalize the tight policy on patent rights written into the space law by Congress last year.

NASA's patent right rules are more restrictive than the Defense Dept's, run in the same tight lines as the Atomic Energy Commission's: The government acquires title to inventions which develop from all work performed under NASA contract. The military services confine their property interest to royalty-free license.

NASA's patent right rules have been under serious attack right from the start. Says one critic, a noted patent lawyer: "No legislation more clearly designed than the Space Act to eliminate patent incentive in a large segment of American industry has ever been proposed or passed."

Interim rules set up waivers . . .

NASA's legal staff has drawn up interim regulations under which patent right restrictions on the Agency's contractors may be waived. Briefly, the curbs on space patent rights may be waived in these cases:

- When the invention was "conceived prior to an independently of, but was first actually reduced to practice in the performance of work under a (NASA) contract, and the invention is covered by a U S patent issued, or application filed by or on behalf of the contractor prior to the award of the contract."
- When the invention has "only incidental utility in the conduct of activities with which (NASA) is particularly concerned and has substantial promise of commercial utility."
- When the invention is "directed specifically to a line of business of the contractor with respect to which the contractor's expenditure of funds in the field of technology to which the invention pertains has been large in comparison to the amount of funds paid to . . . the contractor under the contract in which the invention was made for research or development work in the same field of technology."
- The waiver is for a "nonexclusive, nontransferable, royalty-free license under an invention which does not qualify for waiver" under the other rules.
- The waiver is for an invention in a foreign country in which NASA "does not desire to file an application for patent for such invention."

BULLARD

"H.B.M., Model 75 is better than any other machine we've ever seen."

This statement by Mr. John Gruber, Plant Foreman of George Hantscho and Company, Inc., Mount Vernon, New York, manufacturers of printing equipment, sums up their experience since installing the Bullard 4" H.B.M., Model 75, in June 1957.

He further states "our presses and paperfolding machines are made to order and each job varies from the one before it. Because of this, we can't use assembly line or mass production techniques."

"The only mass production we have is the machining of holes in cast iron, up to as many as 105 in a side frame. Since we've been using our Bullard H.B.M., Model 75, with BULLARD AUTOMATIC POSITIONING we have not spoiled a single piece due to the malfunctioning of the machine."

Do you know the full story on the Bullard H.B.M., Model 75? If not, it will pay you to call your nearest Bullard Sales Engineer — he'll be glad to give you all the details or write

THE BULLARD COMPANY BRIDGEPORT 9, CONN.

DETROIT...

Preview of 1960...

The rash of small car publicity, factual and otherwise, can make one forget that standard-sized cars still figure prominently in automakers' plans for the future. Any talk that these will lose their majority status is purely hypothetical.

Though keeping to the successful theme of conservative, crisply styled proportions, Ford once again will offer an entirely new body shell that will be shared by Edsel. Management was so excited by this new program that it was moved ahead one year.

The push resulted in some casualties. For example, there just weren't enough engineering manhours left over to design a Ranchero pick-up or a retractible hard-top to fit into the new shell. Ford's grill will be car-wide, but Edsel will continue with a vertical, Packard-like version, this time composed of a single impact bar.

Lincoln and Thunderbird will continue with differences detectable only by the expert. Serious consideration is being given to dropping Lincoln entirely by 1961. The Continental name would be continued in a super-luxurious version of the Thunderbird.

The 1960 Mercury will be a major facelift of the existing shell. By completely abandoning the "projectile" theme, more or less evident since the 1957 model, stylists for this make came up with a car that will strongly resemble Ford, and therefore, the Thunderbird. Most distinguishing feature between the two (other than size) will be Ford's new fins, sticking out sideways about two-thirds up on the rear-quarter panels.

No radical mechanical changes can be anticipated for 1960 Ford Motor Co products. Existing engines and transmissions will be continued at least for another year. By 1961, though, there will be new, slenderized automatics designed to minimize the hump in the front compartment. Ford is as active as any company in the development of aluminum engines in orthodox configuration, but has yet to lick the noise problem. In the long run, the company leans toward front-wheel drive as the ultimate solution to satisfactory interior room.

No further forward...

Those who have seen photos of early Chrysler Corp prototypes are amazed at the slight change in styling evident, despite the fact the body shells for the whole line will be of completely new, unitized construction. Continuance of chief-stylist Virgil Exner's dart-like "forward look" is clear, but it should be remembered that prototypes and clay models can look very unlike the car as it is finally trimmed for production.

As one stylist puts it: "The only thing that determines what a car will ultimately look like is the date at which we run out of time." Chrysler, too, has backstopped Exner by signing up William A Schmidt Associates as design consultants. Schmidt, until striking out full time on his own recently, was Exner's executive assistant. The move is significant because in recent years the industry has trended away from outside help.

1960 Chrysler products will emphasize interior innovations, particularly those that will add to ease of entrance and exit. Along this line is a novel almost-square steering wheel and expanded availability of the swivel seat option.

The GM theme...

Essentially, it will be a continuance of current models in terms of minimized chrome. Despite sturdy rumors to the contrary, all divisions will again share a basically identical cowl structure and roof panels.

Buick will switch back to horizontally-paired headlights. Edward D Rollert has been appointed general manager of this division, replacing Edward T Ragsdale, who elected retirement on May 1 after 30 years of service. Likable, blunt Ed Ragsdale conceals from no one his disappointment in the inexplicably poor sales performance of current Buicks.

Pontiac will drop two of its four tailfins and return to two round tail-lights on either side. Chevrolet will flatten out the much-lampooned gull-like effect of its rear styling by raising the low point of the center indent by nearly a foot. A new Hydra-Matic is in the offing for GM makes that use it, but no new engines except for the small car. Swivel seats will be adopted, and air suspension will be continued as an option.

Standard-sized Ramblers are due for a major facelift, but without change in roof-line. Lark will be continued almost unchanged.

And the next decade...

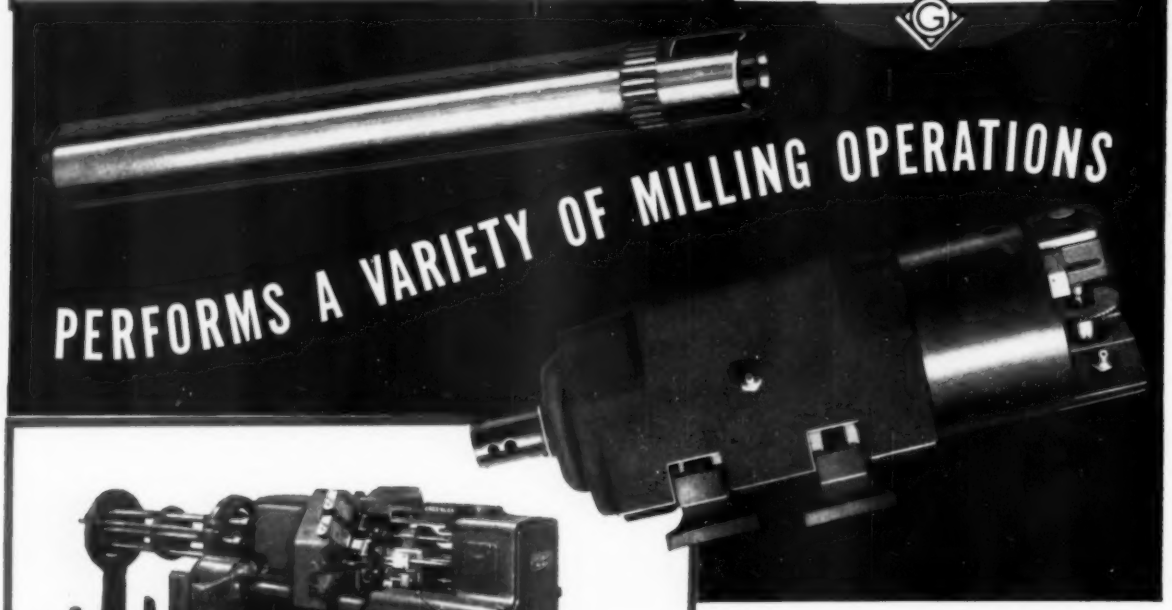
Ford's VP of prognostication, Dr Andrew A Kucher, looks for strong glass-like materials that will combine structural reliability with transparency for use in automobile roofs. He expects new steels of double current strength that can be economically produced for stronger and lighter frames and body panels. And plastics will come along that will be as strong as today's metals so they may be used in body panels and possibly even as load bearing members.

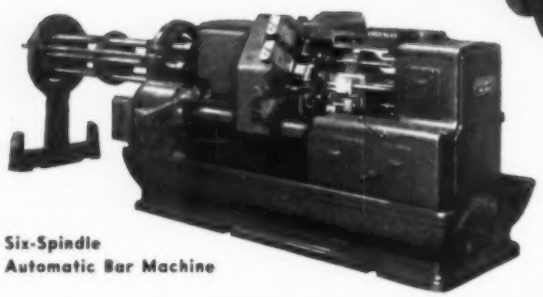
◄ CIRCLE 236 READER SERVICE CARD

GREENLEE MILLING ATTACHMENT

PRODUCTION MACHINERY

GREENLEE





Six-Spindle
Automatic Bar Machine

Mounts on Main Tool Slide

The Greenlee milling attachment eliminates second operation milling on many jobs. Two millers, normally mounted in 3rd and 4th positions, can profitably mill squares or double slot end of work piece at bar automatic speeds. The cutter head rotates at the same RPM as the work piece. Cutter speed is independent of spindle speeds. The Greenlee milling attachment is only one of many versatile standard and special attachments that expand your job range . . . increase your profits. Find out how Greenlee attachments can help you. Get the details from your Greenlee Distributor.

Write for your copy of Catalog A-405 — first step on the way to more profitable production with Greenlee Automatic Bar Machines.

OTHER GREENLEE ATTACHMENTS AVAILABLE

- Eccentric Boring
- Eccentric Drilling
- Eccentric Forming
- Eccentric Turning
- Crimping
- Gear-Fed Reaming
- Relieved Type Facing
- Thread Rolling
- Broaching
- Trepanning
- Hollow Milling
- Burring

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines
- Die Casting Machines

GREENLEE BROS. & CO.

1754 MASON AVE.
ROCKFORD, ILL.

AIRCRAFT and MISSILES...

TRENDS

Defense policy review . . .

The Pentagon's top-echelon policy planners are taking a searching new look at U S deterrent policy — the Strategic Air Command's target schedule, the size of SAC's arsenal of weapon systems, and other elements of this country's nuclear striking force.

The study is likely to have a major impact on future production plans for manned bombers and long-range ballistic missiles.

At issue is the argument of many Navy and Army strategists that the U S is maintaining an "overkill" capacity in SAC, that the size of this country's retaliatory striking power does not have to be augmented (as SAC planners propose), that indeed the Force can be trimmed. The critics claim we already have the capacity to destroy Russia several times over.

SAC's war plans are now geared to a so-called "maximum" or "counter-force" deterrent strategy. This means keying the target schedule to destruction of Russian bomber bases, missile sites, production centers, and other key industrial facilities connected with the country's war-making capacity—as distinguished from simple devastation of population centers.

It means, too, a progressive expansion of U S retaliatory power to concentrate on knocking out the enemy's own growing nuclear strike force.

What's involved . . .

Under present policy, as potential targets increase in numbers, SAC targeting plans are accordingly broadened. But Soviet ICBM development—and the assumption that the new missiles will be positioned in widely dispersed, underground, and highly secret sites—has compounded SAC's target problems to such an extent that many experts now believe an overhaul in strategic planning is needed.

As the critics see it, less than maximum deterrence is adequate. For one thing, they say, our deterrence is weakened by readying our bombers and missiles to destroy enemy missile and bomber bases after an attack has been launched on us. It makes more sense, they argue, to aim our retaliatory force at the enemy's more vulnerable big cities. The size of such a force could be smaller than the so-called maximum force. Yet it would still command respect from the Russians; it would still threaten Russia with utter devastation as retaliation for an attack on us.

Critics' objectives . . .

What the Army and Navy critics see in such a policy revision is this: diversion of defense funds from SAC to their own forces. The Army wants a bigger slice of the military pie to bolster firepower and air and ground mobility of its tactical forces. The Navy wants more for anti-submarine forces, tactical aircraft, modernization of the fleet—and for its Polaris IRBM submarine force (which it considers a less vulnerable nuclear strike force than the Air Force's setup of land-based missiles).

B-70 and F-108 subcontracts . . .

In the course of the House Armed Services Committee probe into weapon system procurement, North American Aviation's President J L Atwood has spelled out who's getting the subcontracts on the B-70 and F-108 projects. Atwood's argument is that weapon system contracting—contrary to the claim of congressional critics—does not restrict the volume of subcontracting.

On the B-70, major subcontracts have been awarded to Boeing, for wing assemblies; Chance Vought, vertical and horizontal stabilizers; Lockheed, fuselage; Cleveland Pneumatic Industries, landing gear; United Aircraft's Hamilton Standard Division, air induction control system; Beech, alert pod; Sperry Gyroscope, auxiliary gyro platform; IBM, bombing-navigation and missile guidance system; Solar Aircraft, engine extracting air ducting system; Sundstrand Aviation, secondary power system.

On the F-108, the big subcontracts have gone to Convair, for wing assemblies; Hughes, fire control; Marquardt, air induction control system; AiResearch Division of Garrett, central air data system; and others.

On both projects, GE is supplying the propulsion system. NAA's own Autonetics Division is developing the automatic flight control system.

Uniform military specs . . .

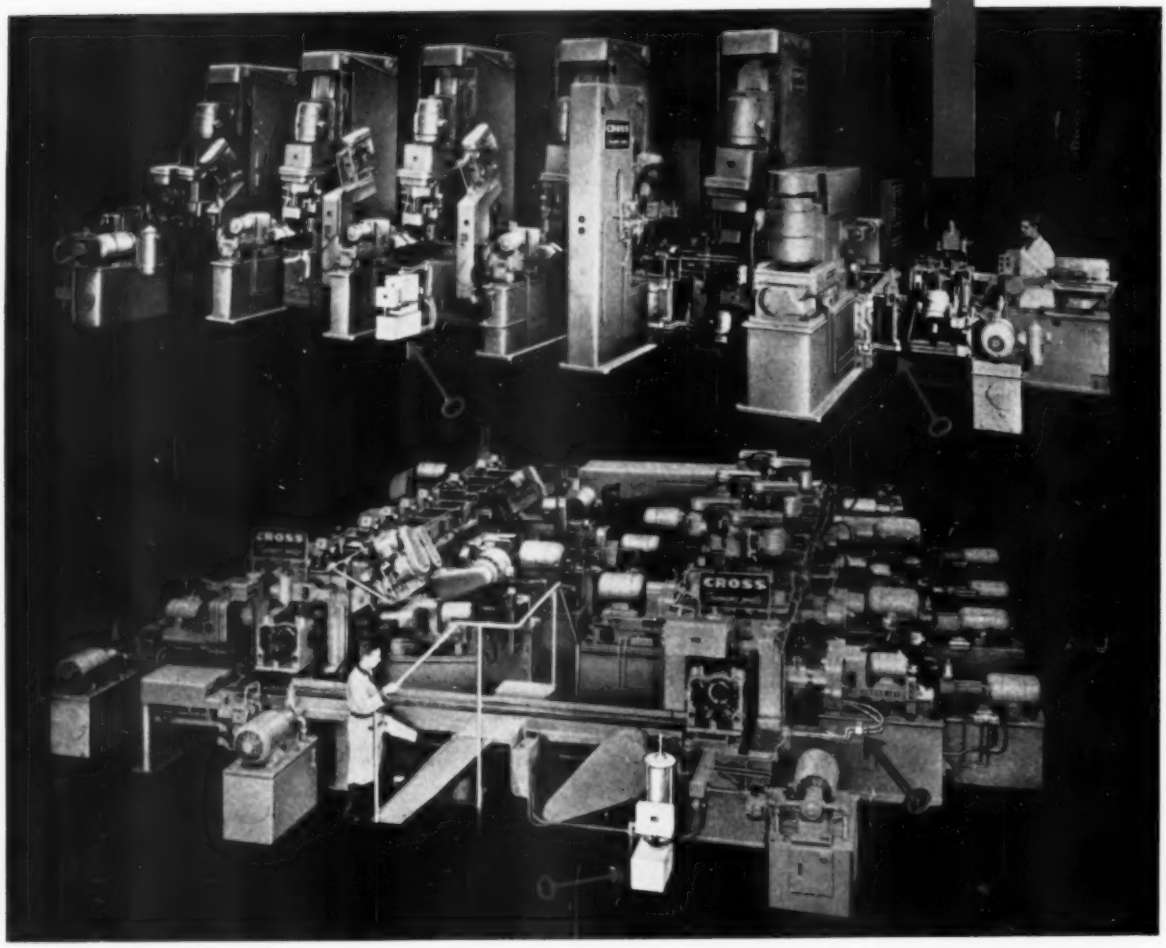
After two years of pulling and hauling, the Defense Dept has finally adopted uniform specs for the procurement of engineering drawings. The new uniform specification will replace 158 specs formerly used by the military services to procure drawings.

The Pentagon calls the action "the first step in a long-range program to establish a basis for interchange of costly engineering data among the military departments and their contractors."

The new rules provide for uniform standards; assure that "only the minimum amount of engineering detail" is bought; set up a standardized order of precedence for design identification and uniform identification of "such things as inseparable assemblies and symmetrically opposite parts."

Lubrication by Farval is automatic, too, on these Cross Transfer-matics

FARVAL—
Studies in Centralized Lubrication
No. 194



● Automation is the soul of Cross Transfer-matic machine tools. They do as many as 73 machining operations one after another on complex parts, delivering more than 100 pieces per hour.

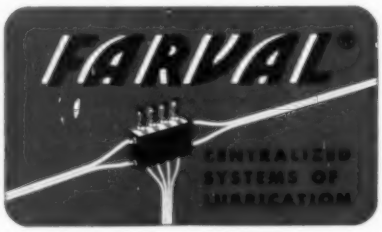
Vital to continuous operation of these machines is the lubrication system. It, too, is automatic. It is Farval. With Farval there is no need to stop a machine for lubrication of even its most inaccessible bearings. And Farval ensures that every bearing receives the proper amount of oil or grease as often as needed.

More and more, machine designers, engineers, and production men are employing Farval to protect the large investments represented by automated production lines. Farval's own sales engineers are available and eager to work with industry to meet any and all problems related to centralized lubrication. For Bulletin 26-R and details of our engineering service, write The Farval Corporation, 3254 East 80th Street, Cleveland 4, Ohio.

®Reg. U.S. Pat. Off.

Affiliate of The Cleveland Worm & Gear Company
(Subsidiary of Eaton Manufacturing Company)

KEYS TO ADEQUATE LUBRICATION—
Wherever you can see these Farval manifolds, dual lubricant lines, and central pumping station, you know a machine is being properly lubricated.



MACHINE TOOLS...

Orders still point up...

Machine tool net orders are continuing to move up slowly, with March showing a small gain over the previous month (see chart on page 96) and April reported holding its own with March.

Incoming business has been widely scattered. Auto makers are moving cautiously. Aside from the small car job, Chrysler's transmission tooling program is mostly yet to be placed. Detroit Transmission also seems in no hurry to buy machines for its new programs.

Buick is reported to be interested in an aluminum engine for 1961, but no tooling has been released for it. Buick is said to have made the decision to have its transmissions made after the 1960 model run by Detroit Transmission, which will use some of the machine tools now installed at Buick for transmission work.

Warner Swasey Asquith Ltd formed

Warner Swasey Asquith Ltd is being formed jointly by the Warner & Swasey Co, Cleveland, and Asquith Machine Tool Corp Ltd, Halifax, England, to make Warner & Swasey single-spindle automatics for the United Kingdom, European and other world markets.

Manufacture at first will be in Asquith's Halifax plant and later in separate facilities to be provided by Asquith. The new company will operate under a Warner & Swasey license.

Sales of the machines made by Warner Swasey Asquith Ltd and of other Warner & Swasey machine tools in the U K will be handled by Drummond-Asquith (Sales) Ltd, an Asquith subsidiary. Other foreign sales of both British and American built Warner & Swasey machines will be made through W&S distributors in various countries.

By building its single-spindle automatics in England, Warner & Swasey will be able to get production costs down to a point at which it can tap foreign markets from which it has been excluded up to now.

Walter K Bailey will be chairman and Robert Asquith deputy chairman of the new company. James C Hodge and C W Bliss as well as Mr Bailey will represent Warner & Swasey on the board.

China to build 90,000 machine tools

Around 90,000 machine tools will be produced in Communist China this year, according to Robert W Asquith, chairman of Asquith Machine Tool Corp, Ltd. Mr Asquith recently visited China and saw the astounding progress that the Chinese are making in building machine tools.

There is considerable accent on manufacture of heavy machine tools, he said in New York. The Wuhan heavy machinery plant, with 10,000 employees, probably will build 350 machines a year from now on. The No. 1 Peking lathe plant, which strangely does not make lathes, turned out 1300 milling machines last year and is aiming to double its output this year. At Shanghai about 4000 workers are busy producing grinding machines. Mr Asquith visited all three of these plants.

These factories are equipped with machine tools supplied by Russia, Czechoslovakia, East Germany and other Communist countries. Mr Asquith saw only one machine, built in West Germany, from a western nation. He revealed that China this year will produce as much steel as the United Kingdom.

Communist China is building enough general-purpose machines of its own and is getting enough from other Communist countries that it is not interested in buying any from the West, Mr Asquith said. China, on the other hand, may place some orders for heavy machine tools with British builders, who now have token orders.

Russian orders to British builders are dependent upon granting of long-term credit to Moscow, Mr Asquith declared, or upon an Anglo-Russian trade agreement. The latter is more likely than the former.

To meet foreign competition...

To forestall any inroads in importation of broaching machines, Lapointe Machine Tool Co is introducing in the domestic market a bench-size, pull-down broaching machine priced at $970.

It is designed for short-run, general-purpose broaching. The number of imported broaching machines up to now has been small, because most broaching machines are built for special purposes.

To compete successfully against imported tools, Precision Tool & Mfg Co has put on the market a multiple-spindle drilling and tapping machine, called the Deka-Drill, selling at $1998.50 for the manual model and at $3545.75 for the hydraulic model.

BT

SPECIAL REPORT
Steel Buyers Get Strike Fever:
Hedge Buying Begins
IRON AGE
through May and April. The
May Be Too Late—The situa-
tion in Pittsburgh indicates a na-
tionwide trend is in the making.
Market Outlook
With Stocks at Low Ebb, Rush Is on
STEEL
DEMAND for steel is rising rapidly as consumers
strive to replenish low inventories. Fabricators
who let their stockpiles decline last year are sud-
denly realizing that they don't have enough met-
porary." Taking an opposite stand (though he

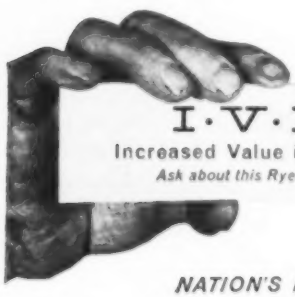
Report on Ryerson stocks as steel squeeze tightens

Steel stocks at Ryerson are at an all-time record high—in tons, types and sizes. Fortunately, Ryerson anticipated a squeeze situation and began laying in stocks of steel *months ago.* You can depend on Ryerson to furnish steel of high, uniform quality and to maintain its regular policy of fair, published prices.

Avoid loss of cost controls

Don't let the steel squeeze trap you into scrapping cost control programs based on sound inventory policies. You've proved the economies of avoiding long-term commitments—and the high "cost of possession" that goes with them. Call Ryerson for risk-free steel buying and get the steel you need when you need it—cut to exact size and ready to use.

Your Ryerson representative is well qualified to review the facts and help you get the maximum value for your steel-buying dollars. Ask him to analyze your requirements with you the next time he calls.



I·V·B·M
Increased Value in Buying Metals
Ask about this Ryerson Plan for 1959

RYERSON CERTIFIED QUALITY

RYERSON STEEL®
Member of the INLAND Steel Family

STEEL • ALUMINUM • PLASTICS • METALWORKING MACHINERY
NATION'S MOST COMPLETE SERVICE CENTERS IN PRINCIPAL CITIES COAST TO COAST

MATERIALS...

New motors for old...

It is not uncommon these days, as one visits industrial plants, to hear people bemoan the loss of value in modern components. New designs, miniaturization, new materials, plastics, all seem to be creating products which appear to have less value than their predecessors. Can this be true? In some remote instances, products may be cheapened by new practices. However, the vast majority of modern industrial products are capable of performing their function much more efficiently than the equipment they replace.

Let's look at motors as an example. You'll hear people say, "These new motors just don't have the power the old ones had. And look at the size—puny little lightweight things compared with the motors we used to get; no guts." First, you must ask whether the ability of a motor should be measured by its size and weight or by its power and efficiency. Then, if the critic has a specific motor in mind, it helps to know whether the new motor replaces, horsepower for horsepower, the old motor—or whether the application was reevaluated before replacement.

Just as there are still people who buy machine tools by the pound, many people haven't changed their motor-buying habits in 20 years. Meanwhile, research and development have made significant changes in the factors for motor selection. Many of the problems of motor reliability, of maintenance and performance, that yesterday were solved by overbuilding, today are guaranteed by design. For example, motors bought 30 years ago are rewired today to give 25 to 50% more horsepower.

Motors built today don't allow this kind of upgrading. Why? Because designers of the older motors could only guarantee specified performance by exceeding it—and charging for the excess. Wire had to be heavier, insulation had to be thicker, frames and bearings had to be larger, and motor controls needed much more space.

To meet a specific function...

Today, motors are designed in computers, or with computer-generated data. In effect, a special computer is programmed so that it becomes a synthetic motor. All of the desired characteristics and working conditions for a given motor are fed to the computer and it provides the best combination of design elements to guarantee specified performance.

Rebuilding this motor won't give you much improvement, of course, but the motor will do the job you have specified, at the best cost and efficiency. If you need more power later, chances are you can replace this motor, with one designed for *all* of the new operational requirements, at less overall cost than you would pay for rewiring it. Designers of electric motors are saying that at the present rate of motor improvement, tomorrow's motors may have the hour-glass shape. The bearing housings will be bigger than the electrical portion of the motor.

New silicone insulation systems developed by Westinghouse, General Electric and others, permit drip-proof motors to be used on many applications in wet or corrosive areas. Thus they can replace splash-proof and totally enclosed motors at a 25 to 50% saving in cost. GE's new "Custom 8000" general line of ac motors, with ratings from 100 to 600 hp, has a box, or "square," frame rather than the conventional round shape to improve its appearance, for external use, and save space. Flat end shields make the motors significantly shorter, to save from 22 to 45% in mounting area.

The "building-block" concept is used for GE motors rated at 900 hp and higher. Eventually it will be used for all of the motors in the line. This design, together with the square shape, means that accessories can be mounted on the motor frame more readily and the motor can become the base of a machine rather than enclosed in a separate base or adjacent to it. Maintenance is simplified by new antifriction bearings and new lubrication systems, as well as more easily removed end shields.

New insulating materials make possible the use of conventional motors for Class B (130C) applications. By going to the higher temperature, motors can be used more efficiently.

Control of direct current...

Another important area to consider in motor selection is control. Recent developments in static control devices have greatly simplified the size and complexity of controls for larger dc motors. At the Westinghouse Machine Tool Forum in Buffalo (Apr 14 & 15, 1959), that company's engineers pointed out that these developments have extended the magnetic amplifier principles beyond nominal applications in control circuits to applications in which large blocks of power are handled. Thus, the constant hp capabilities of direct current motors are practical and available in a much broader range.

Another industry trend is the package-drive concept. Many users are finding significant values, particularly the final cost, in factory-wired and tested motor-and-control packages.

FROM *Chicago-Latrobe* RESEARCH AND ENGINEERING

AN UTTERLY NEW DESIGN OF TWIST DRILL

The NEW C-L "LO-TORK" BRAND Chip Breaker Drill

END VIEW SHOWS THE DIFFERENCE IN BASIC DRILL CONSTRUCTION

PATENT APPLIED FOR

UNRETOUCHED PHOTOS (BELOW)...dramatic proof of C-L "Lo-Tork" Drill's chip breaking effectiveness. At left is conventional drill—At right is the "Lo-Tork." Same work piece in each photo.

Completely New! C-L "Lo-Tork" Drills end stringy chips . . . speed production . . . improve lubrication

• This announcement may be of great importance to your plant. Chicago-Latrobe research has produced a chip breaking drill that *works*. Utilizing a unique profile, the C-L "Lo-Tork" Drills not only reduce chips to manageable size, but greatly increase the flow of coolants to the drilling point. These drills have been exhaustively tested on production machines in numerous plants. C-L "Lo-Tork" Drills may well be the final answer to your problem of stringy chips. Get full information at once.

WRITE FOR DESCRIPTIVE LITERATURE . . . OR CALL YOUR C-L DISTRIBUTOR AT ONCE

CHICAGO-LATROBE DRILLS · REAMERS · END MILLS · COUNTERSINKS · CARBIDES · SPECIALS

416 W. ONTARIO STREET, CHICAGO 10, ILLINOIS

WHAT'S AHEAD... in Metalworking

TRENDS

Metalworking output nears new high . . .

Metalworking production is continuing its steady climb back to the peacetime peaks it reached late in 1956. April's 172 on the American Machinist Index of Metalworking Production is now within 10 points of 1956's all-time high (1947-1949=100) and is 26 points ahead of the recession low point just a year ago.

Continuing to pace metalworking's upward climb are the automotive, appliance and farm equipment industries. Reporting steady increases, too, are the capital goods and other basic metalworking industries.

The spring surge in automotive sales and production continues to hold up. It is now estimated that new car inventories are at a 900,000-unit level, which the industry feels is high but justified by current sales.

Automotive parts manufacturers say that April sales have been high but "with an inventory like that staring us in the face, business will have to stay good." Some parts makers feel that current production levels are a little out of line with sales volume. Truck parts manufacture, up 35 to 40% over last year, continues good.

Prospects for the aircraft parts industry vary from company to company. Orders for military aircraft engines have been dropping off steadily for the last two years, but orders for commercial plane parts are on the increase, and the spare parts business is holding up well.

Appliance sales and production continue to head for new highs month by month. One major manufacturer expects its record year, 1955, to be exceeded in output by 47% this year. This manufacturer characterizes home freezer sales as "terrific" (up 247% over last year), dryers as "not too bad" (up 20% over last year), refrigerators as "very good" and ranges "probably the poorest."

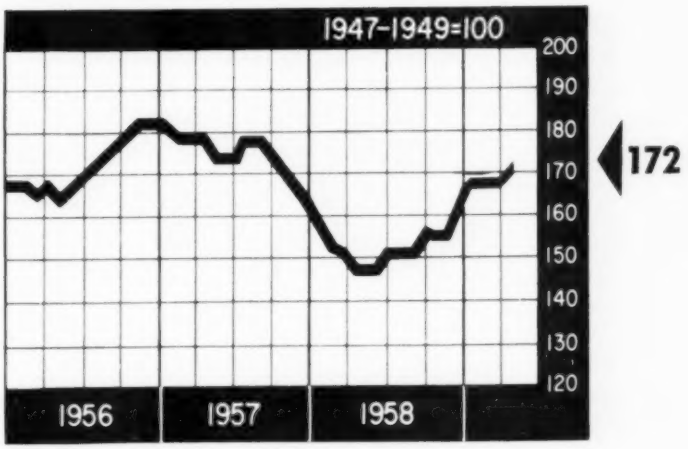
One major radio and TV manufacturer expected first quarter sales to exceed last year's by 80%. Actually, totals were 105% ahead of first quarter 1958 and the company looks forward to its best year. TV sets, auto radios and Hi-Fi are all booming, with auto radios and television sets now on allocation. Sales of portable, clock and auto radios are still disappointing, however.

Farm equipment production is still at high levels (tractors, for instance, are running about 50% ahead of year ago levels) but some industry executives are wondering how long the current high rate of sales and output will hold up.

Most farm implements have yet to come into their selling season, but it's expected sales will be brisk in this field, too. Industry employment is running far ahead of 1958 levels.

Construction machinery business has picked up considerably over the last two months, with manufacturers reporting increases of 20 to 30% over the same period last year. Sales of construction machinery have had more effect on factory output than have farm equipment sales, mainly because construction equipment dealers haven't had to dispose of such large inventories.

Railroad equipment makers are still operating at reduced levels, but at least the trend is upward now, barring a possible slowdown because of a prolonged steel strike.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

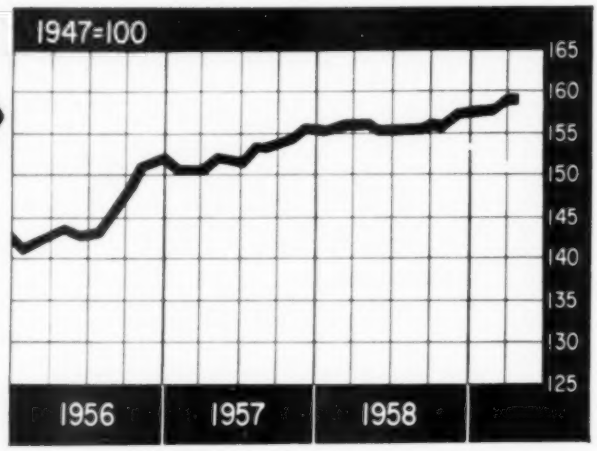
	APR Estimated	MAR Preliminary	FEB Revised	MAR Year Ago
Total Index	**172**	**170**	**168**	**150**
Machinery	141	138	127	
Electrical Machinery	192	199	170	
Autos	131	129	94	
Other Transportation	340	335	333	
Other Metalworking	147	144	130	

TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	APR Estimated	MAR Preliminary	FEB Revised	MAR Year Ago
Total Index	**158.7**	**158.5**	**158.4**	**156.0**
Metalworking Machinery	**183.7**	**182.6**	**182.3**	
Other Machinery exc. Electrical	**170.1**	**169.9**	**166.0**	
Electrical Machinery	**158.9**	**158.6**	**157.5**	
Fabricated Metal Products	**148.7**	**148.7**	**146.6**	



Financing the capital spending upturn...

Business spending for new plant and equipment will rise to $34.2 billion this year, according to McGraw-Hill's recent survey. This means more than $2 billion will be spent over and above 1958's total outlay. Where will business get the extra funds?

Most of the money will come from depreciation reserves earmarked for spending on capital goods. Business now expects to lay away more than $22 billion this year for depreciation allowances on plant and equipment.

This money will provide about two-thirds of the amount needed to carry out modernization and expansion planned for 1959—a big improvement over the immediate postwar years, when only a third of business' capital spending could be accounted for in this way.

Rising profits should provide most of the remaining $12.2 billion needed by business to carry out its 1959 capital spending plans.

Those firms who must turn to the market for capital won't find money cheap. Interest rates have been rising in recent months.

But credit shouldn't be scarce. One reason: the federal deficit will be far lower during the next fiscal year and the Treasury thus won't be as much of a force in the money market.

Depreciation allowances will become more and more important as time goes on. For instance, business now plans to add more than $24 billion to its depreciation funds in 1960, and even greater amounts in 1961 and 1962. As such internal capital becomes available, businessmen will feel more willing to replace obsolete equipment.

Business spending depends upon earnings—and earnings prospects are good.

First-quarter earnings statements are already in, and they support the optimistic outlook. Thus, a steady flow of funds should be available to meet capital spending needs.

WEEKLY BUSINESS INDICATORS

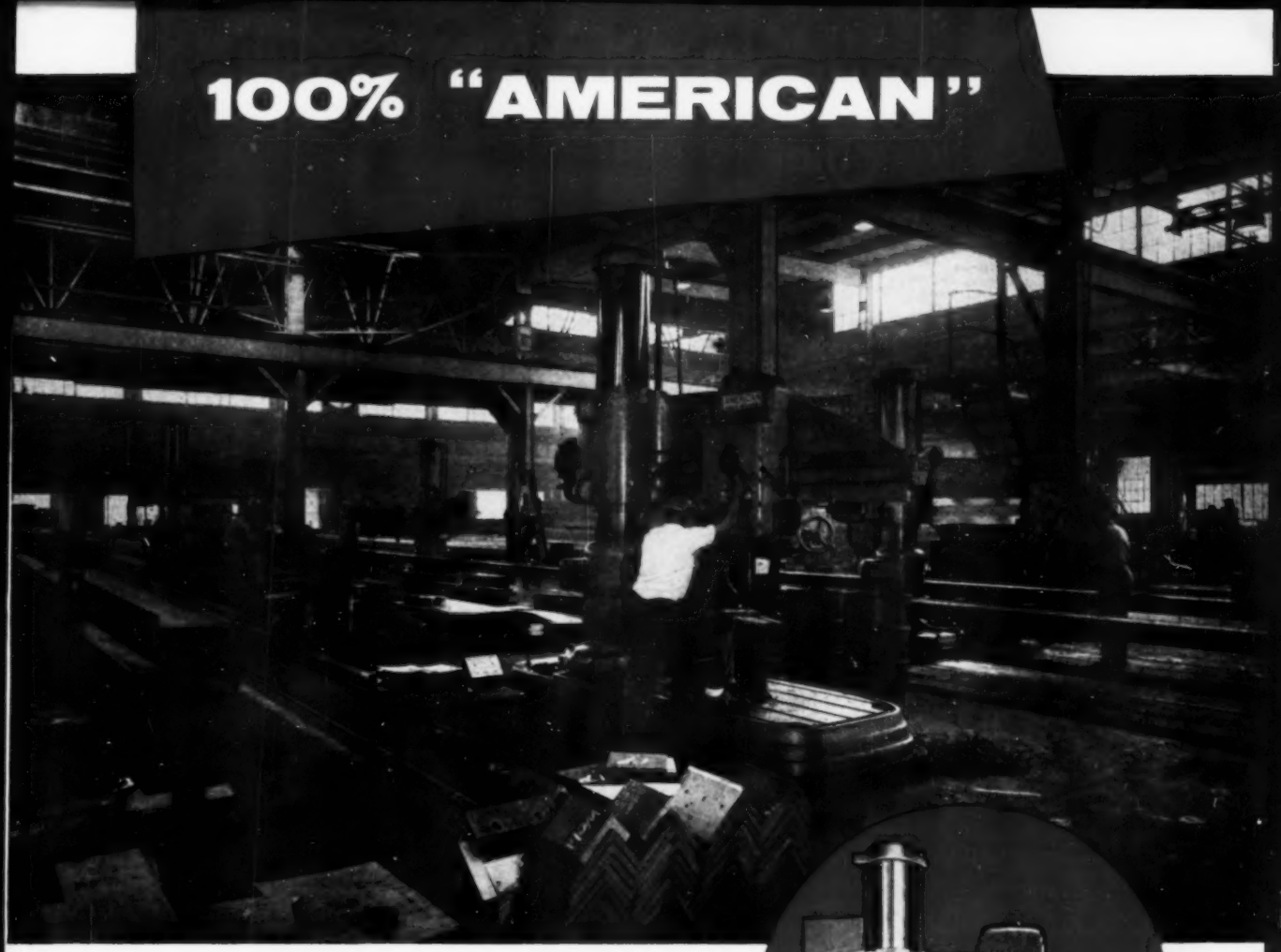
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	149.4	149.4	120.7
Steel ingot operation (thousands of tons)	2,657	2,641	1,285
Electric power output (million Kilowatt hours)	12,609	12,604	11,107
Production of automobiles and trucks	171,508	169,157	98,885
Engineering construction awards (Eng. News-Record—millions)	$314.3	$371.3	$325.7

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	147	145	128
Index of durable manufactures production (1947-1949=100)*	160	156	135
Durable goods manufacturers' sales, millions*	$13,826	$13,541	$12,038
Machinery manufacturers' sales, millions*	$ 4,098	$ 4,017	$ 3,726
Durable goods manufacturers' new orders, millions	$14,921	$13,900	$10,688
Machinery manufacturers' new orders, millions	$ 4,195	$ 3,937	$ 3,545

* Seasonally adjusted

100% "AMERICAN"



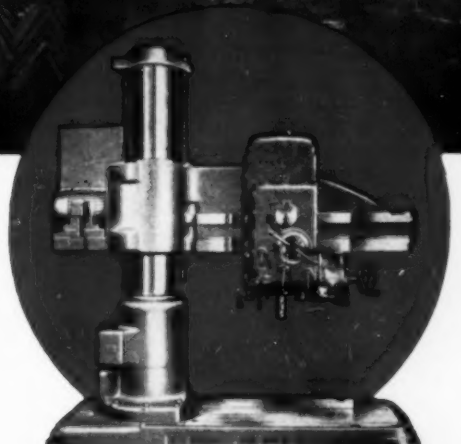
The Stupp Bros. Bridge and Iron Company of St. Louis, Missouri, known the country over as one of the leading structural steel fabricators, use "AMERICAN" Radial Drills exclusively.

Mr. Erwin P. Stupp, President, gives as his reasons for his continuous selection of "AMERICAN"—

- EASE OF HANDLING
- RIGIDITY
- FAST MANIPULATION
- LOW MAINTENANCE

These factors combined with the extra power offered by "AMERICAN" Hole Wizard Radials guarantee a handsome return upon the user's investment.

The half dozen "AMERICAN" Radials installed during the past 10 years are conclusive testimony to the satisfactory service afforded by these modern drilling, boring and tapping machines.



PLUS FEATURES

- Centralized Control.
- Lightning-fast Direct Reading Speed Change.
- Nitrided Spindle and Sleeve—practically wear proof.
- Timken mounted column unit defies deflection.
- Raybestos covered, spring steel tapping attachment friction bands, quick acting, wear proof, permitting 40% speed-up for spindle reverse.

Send for bulletin No. 328

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U.S.A.

LATHES AND RADIAL DRILLS

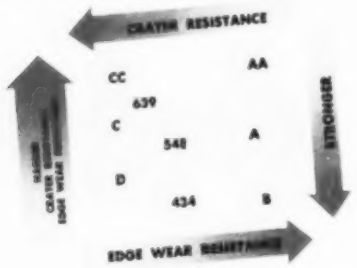
CIRCLE 241 READER SERVICE CARD

New! ADAMAS Grade Selection Chart

YOUR GUIDE TO PROPER GRADE SELECTION

MATERIALS

Cast Iron, Copper, Aluminum, Brass, Bronze, Magnesium, Molybdenum, Rubber, Fibre, Masonite, Wood, Plastics, Zinc Alloys, Titanium and Titanium Alloys, Nimonic A, Ni Hard, light cuts on 300 stainless steels. Any material where feed of less than .005 is being used.	SAE 1000, 2000, and 8600 Series.	SAE 3000, 4000 Series SAE 52100, Nitralloy, Monel, Inconel. Heavy cuts on Series 300 Stainless Steels. Series 400 Stainless Steels.
ADAMAS GRADE B, A, AA	**ADAMAS GRADE D, C, CC**	**ADAMAS GRADE 434, 548, 639*** * Grade 639 stocked only in throwaways.
ALSO USED TO MACHINE ANY MATERIAL WHEN EDGE WEAR IS THE PRIMARY PROBLEM.	**ALSO USED TO MACHINE ANY MATERIAL WHEN CRATERING IS THE PRIMARY PROBLEM.**	**ALSO USED TO MACHINE ANY MATERIAL WHEN BOTH EDGE WEAR & CRATERING ARE PROBLEMS.**



EXAMPLES

WHEN MACHINING A MATERIAL WITH GRADE A . . .
- If excessive edge wear occurs change to Grade AA.
- If chipping occurs change to Grade B.
- If cratering is excessive change to a steel cutting grade (probably Grade C).
- If both excessive edge wear and cratering occur switch to Grade 548.

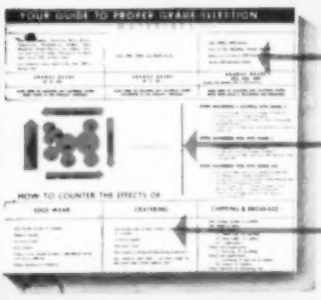
WHEN MACHINING STEEL WITH GRADE C . . .
- If excessive edge wear occurs change to Grade CC.
- If chipping occurs change to Grade D.
- If cratering is excessive change to Grade CC.
- If both excessive edge wear and cratering occur switch to Grade 548.

WHEN MACHINING STEEL WITH GRADE 548 . . .
- If excessive edge wear occurs change to Grade 639.
- If chipping occurs change to Grade 434.
- If cratering is excessive the grade change depends upon the type of steel being machined.
  (a) If a carbon steel — change to Grades C or CC.
  (b) If an alloy steel — change to Grade 639.
- If both excessive edge wear and cratering occur switch to Grade 639.

HOW TO COUNTER THE EFFECTS OF . . .

EDGE WEAR	CRATERING	CHIPPING & BREAKAGE
Use harder grade of carbide. Reduce speed. Increase feed. Use coolant. Check center height of tool — tool above center will cause rubbing. Check hardness of material.	Use harder and, or more crater resistant grade of carbide. Increase speed. Decrease feed. Use coolant with good lubricating properties. Use positive rake tool — increase angle to decrease chip friction against tool.	Use stronger grade of carbide. Use negative rakes. Check tool design: (1) shank size (2) tip size (3) lead angle (4) radius (5) chipbreaker Check tool preparation: (1) brazing (2) grinding Check tool application: (1) overhang (2) tool not on center (3) amount of coolant Check machine for looseness, etc.

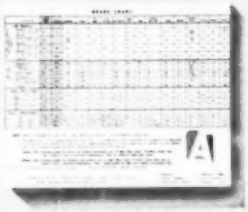
Designed to give you a practical guide to carbide grade selection and application.



Shows what grades to use on a wide range of materials . . . stainless steels, titanium, etc.

Quick reading diagram for fast grade reference.

Valuable application data on how to counter the effects of Edge Wear, Cratering, Chipping and Breakage.



Reverse side carries complete and up-to-date Carbide Industry grade chart (Industry designations C-1 thru C-14).

Ideal for shop posting or desk use . . . size 8" x 10", printed on heavy soil-resistant, high gloss stock.

Send for your Free copy of this chart today.

ADAMAS
CARBIDE CORPORATION
KENILWORTH, NEW JERSEY

Producers of Tungsten Carbide Tools, Tool Tips, Dies, Wear Parts and Dex-A-Tool

CUT OUT AND MAIL

ADAMAS CARBIDE CORPORATION
DEPT. 382 KENILWORTH, NEW JERSEY

Please send me a copy of the new Adamas chart titled *"Your Guide To Proper Grade Selection"*.

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Where Does "Onward-and-Upward" Lead?

Onward and upward forever. It is a wonderful idea if it will work.

For years the unions have been working it for all it is worth, and more. Regardless of economic conditions and of the state of health of individual companies, wage rates and fringe benefits are supposed to go in only one direction—UP.

All sorts of devices . . .

are resorted to. There is the so-called "annual improvement factor" to allow employees to benefit from the savings made by mechanization by a yearly automatic hike in wage rates.

But suppose a company is faced by "a loss factor?" Are employees to be expected to share in the loss? You know the answer.

Then there is the "cost-of-living" factor. When the living-cost index rises, wages are to be adjusted to compensate. What happens when the index declines? That is a nasty question and you should know better than to ask it.

Then, again, look at the competition among union leaders to secure the biggest and best wage package for their members. If Walter Reuther negotiates skilfully and brings home the bacon to his automobile workers, Dave McDonald feels a compulsion to bring home to his steel workers bacon AND eggs.

Like every good and true . . .

union leader, Dave McDonald is an ardent advocate of the onward-and-upward philosophy. He currently is about to engage in conversations with Big Steel to sell a billion dollar package on behalf of his members. That means, of course, a billion dollars of increased labor cost for the steel industry.

If he should come anywhere near getting what he asks for, advances in steel prices will be inevitable. And away the nation will go again on another round of bigger wages and higher prices.

Just where is this sort of thing going to lead us, as it is repeated time after time? For one thing, the onward-and-upward philosophy is rapidly forcing American industry into an untenable position.

Labor costs and product prices have soared to such heights that some of our industries are becoming "sitting ducks" for foreign competition. We are pricing ourselves out of world markets. More than that, we are making it tough for our manufacturers to compete pricewise against imported goods here at home.

Some industries, such as the farm implement and typewriter, already have been driven to importation of their own products made in their own overseas plants. Other industries are almost sure to follow suit as the squeeze gets tighter.

So interunion rivalry . . .

over getting something for the boys has grave and far-reaching effects. It is not just a matter of Dave McDonald doing better for his members than Walter Reuther for his. The question eventually is: What can we do to prevent the wage-and-price spiral from zooming into outer space and exploding, with the American economy a fatality?

The Dave McDonalds have a responsibility not only to their members, but also to the American people. We hope that they will act with sufficient statesmanship, courage and restraint so that American industry is not forced to price itself out of both domestic and world markets, with disastrous results for all of us.

Burnham Finney EDITOR

57-74

Specify Ex-Cell-O standard power units and cut your machine tool lead time

Today's demand for increased productivity, lower per-unit cost, even on relatively short runs, is being met economically by automatic, single-purpose, high-production machines—consisting essentially of a plain base and one or more Ex-Cell-O Quill-Type Hydraulic Power Units. Their flexibility allows them to be used over and over again, spreading their initial cost over many productive years.

These standard, self-contained Ex-Cell-O Hydraulic Power Units are now being used for: drilling, counterboring, spot facing, reaming, as well as prime movers for milling equipment. With multiple spindle head attached to quill flange, multiple operations may also be performed.

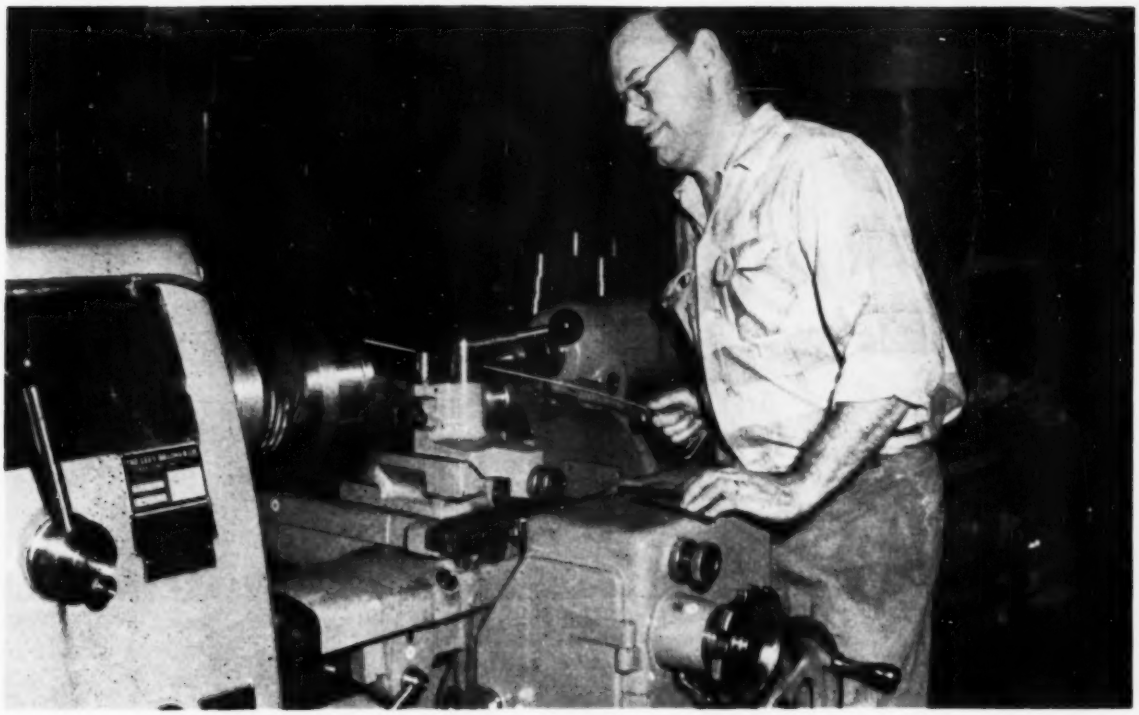
For the full story on the cost-saving advantages Ex-Cell-O Self-Contained Power Units offer your short- or-medium-run production requirements—get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

*Style 22—8-inch Stroke; Style 22-L—12-inch Stroke

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE 243 READER SERVICE CARD



High-speed threading operation lowers tool cost and operating cost

Aim at Watervliet: Cut all threads by "rapid threading"

By Richard T Berg,
assistant editor

All production threading at Watervliet Arsenal will be performed on rapid-threading machines with single-point carbide tools—even when it means developing new equipment to handle workpieces beyond the capacity of present machines. That's the goal of the Rapid Threading Program being pursued here by the Operations Engineering Branch. The only exceptions will be parts harder than Rc 50.

Already, under the guidance of Charles Rose, project leader in the Machine Tool and Process Development Section, the Program has gained a number of cost reductions by switching small and medium parts from thread grinders and thread mills to Cri-Dan rapid threaders.

Larger parts are slated to run on a Bullard Cut Master, adapted to Man-au-trol operation and probably the first vertical machine for rapid threading. It was specially converted for this type of operation but retains all the flexibility of a conventional vertical turret lathe.

In development is an automatic attachment that will convert a standard lathe and still allow it to perform normal lathe operations.

Rapid threading with carbides is not a new idea. However, even though many European concerns have been applying it to good advantage since the end of World War II, US manufacturers have been slow to accept it.

Upon evaluating the process, Watervliet engineers discovered that it possesses a good many advantages over other threading techniques. Speed and cost are the main ones, but quality is important, too.

It operates much faster than either thread grinding or thread hobbing. And it produces a better finish than hobbing does — a smoother finish, without scallops.

Tool cost is low because the single-point tool is less expensive to originate and maintain than either a multi-point thread hob or a grinding wheel with its dressing diamonds. Lead time required for tooling is also a good deal lower.

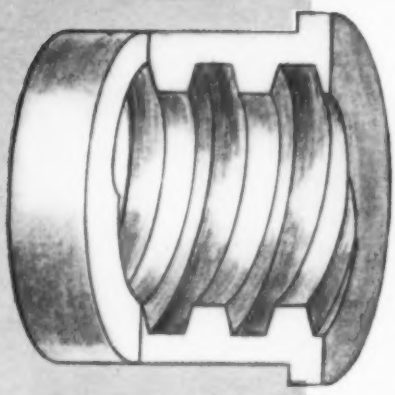
Compared with grinding, the machine requires about half as much floor space, and, as it normally operates without coolant, there is no need for elaborate ducting to carry off oil mist and fumes.

Essentially, the process is a speeded-up version of conventional thread cutting on a lathe. The added speed comes from two main factors: carbide tooling and automatic operation.

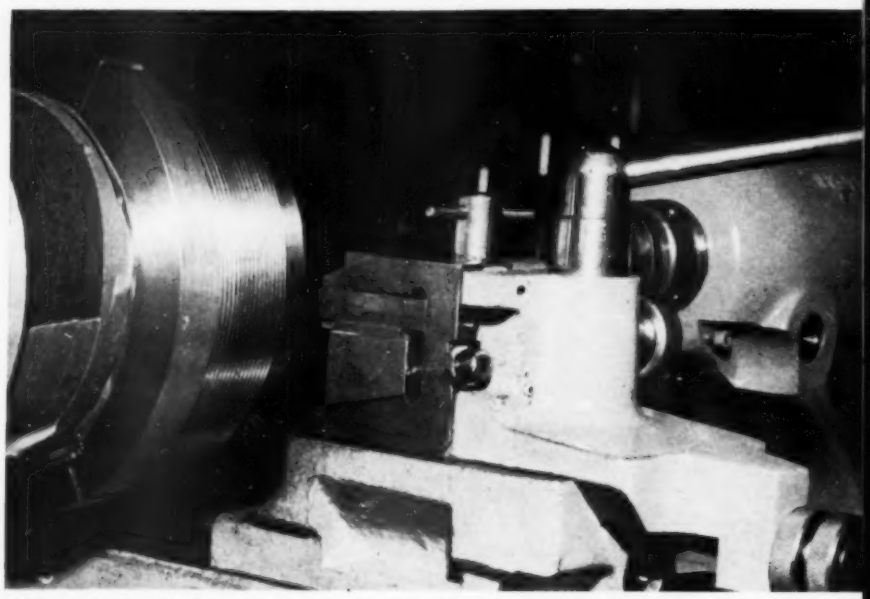
Carbide tools permit higher spindle speeds along with deeper cuts, both tending to increase the rate of metal removal. Automatic operation eliminates much of the time that would otherwise be spent in manipulation —withdrawing the tool from the cut, returning the carriage to the start of the next cut, and setting the tool at the proper depth.

Not only does this remove the human element once the setup is made,

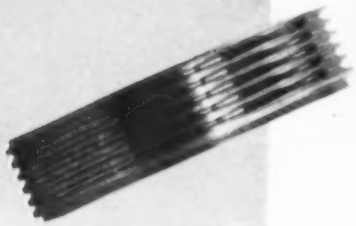
Cut all threads by "rapid threading" . . .

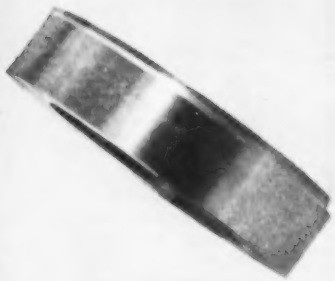


Production jumped when this 1-in. bushing was moved to a rapid-threading lathe with carbide tooling



Eight-inch threads are cut by standard rapid threading lathe. Breechblock bushing for 106-mm recoilless rifle has a hardness of Rc 35-41





6-in.-dia breech block for 106-mm recoilless rifle is threaded at 48 pcs per day

but in many instances it will permit multiple-machine operation by one man.

One good example of Watervliet's success with the technique is an internal threading operation on a 1-in. bushing. The part is made of either 1120 or 1130 stock and has four Acme threads per inch. The major diameter is 0.832 in.; the PD is 0.737 +0.020, −0.000 in.; and the thread depth is 0.080 in.

A thread mill could turn out only 80 to 95 of these parts per day (5 to 6 min each). Now, however, with a Cri-Dan Model B rapid-threading lathe, production has jumped to an average of 320 parts per day, or 1½ min per piece, floor-to-floor time. The actual cutting time amounts to only 28 sec, at a speed of 260 sfpm.

Tool life varies

Tool life on this operation has not settled down yet. It seems there is only a slight difference between a long-lasting tool and one that breaks up quickly. The first five pieces with a new one tell the tale. If it's still in good shape after those five, the men on the machine say it will probably do another 250.

On larger pieces, the technique has proved itself just as efficient. Two of them are the breechblock and the breechblock bushing for the 106-mm recoilless rifle.

This bushing screws into the gun tube to become a fixed part of the assembly. The block, in turn, mates with the ID of the bushing and is closed for each round fired and then opened to permit reloading.

The 8-in. OD of the bushing has a standard thread with a pitch of 8. Tolerances are 0.007 in. on PD and 15 min on thread form. The OD of the block is 6 in. across and has a pitch of 4 Acme threads per in. Tolerances are the same.

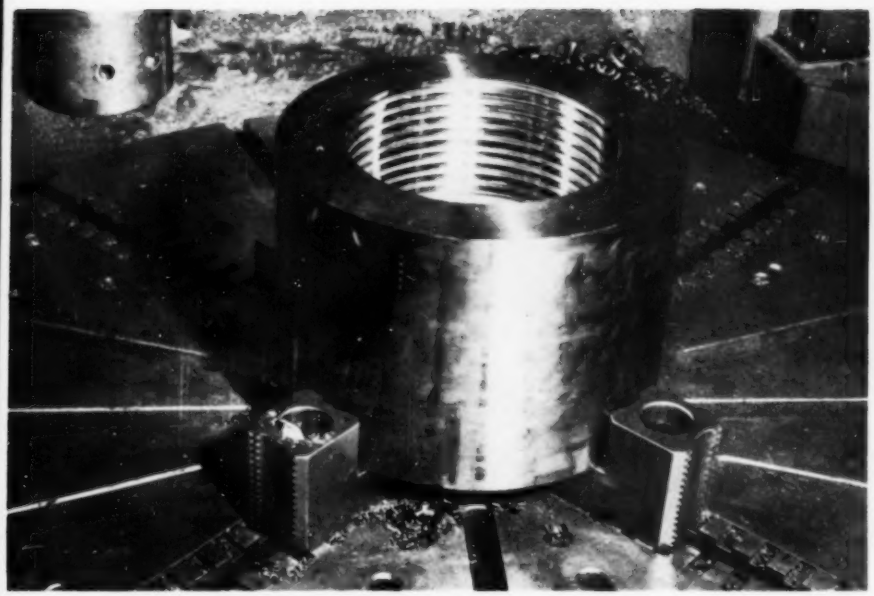
Both operations have been switched over from a thread grinder to a Cri-Dan Model D rapid-threading lathe. Output for each has increased to 48 pieces per day from the previous rates of 13 per day for the bushing and 14 for the block.

Heavy parts: new approach

But, when it came to applying the technique to even larger pieces such as the 800-lb breech ring of the 90-mm cannon, the Watervliet engineers found they had outgrown the capacity of the available machines. However, the attractions of rapid threading were so great that they decided to figure out a way to make it work.

Because of the size and weight of the breech ring casting, they reasoned that it would be easier to handle the piece and chuck it accurately if they could machine it in the vertical position instead of the horizontal. This was a new departure in rapid threading but one that looked promising.

A vertical turret lathe can do thread chasing, and there was a



800-lb casting required new approach to single-point threading. This breech ring for 90-mm cannon was machined in VTL equipped for automatic threading

56-in. Cut Master Model 75 that could be assigned to the job. Still, a large part of the potential savings from the technique would be lost if the operator had to manipulate the machine manually. Therefore, Watervliet discussed the problem with The Bullard Co of Bridgeport, Conn., and made arrangements to convert the Cut Master to automatic operation.

The company shipped its standard conversion unit and a thread-cutting and drum-scoring attachment. These were installed at Watervliet by a Bullard service engineer, and the Cut Master actually became a Man-au-trol Model 75, Bullard's automatic VTL.

Conversion decision

The conversion could have been made on a 46-in. Cut Master Model 75 that was also available, and the smaller machine could have done the job at hand. However, the decision went to the 56-in. machine for several reasons.

For one, the bigger machine has more power and can make heavier cuts. For another, it provides more flexibility for future experiments on even larger pieces.

Just as important, however, is the larger, heavier faceplate that acts as a flywheel and smooths out the rotation of the part. This flywheel effect has been put to good use in all the recent work here on ceramic tools (AM—Jan 26, '59, p100), and it has almost become an axiom that a larger faceplate or chuck will give better results than a smaller one.

When the converted Man-au-trol is set up to thread the breechring, 35 of the 39 functions on the control drum are devoted to locating the cutting passes: 10 passes at 0.005 in. each, and 25 at 0.004 in., for a total depth of 0.150 in. to the bottom of the Acme threads. The major diameter is 10.000 in.; the thread length is 6 in.; and the pitch is 2.

Each function commands the following movements of the main turret: feed to depth of cut; feed downward through the piece; withdraw tool; and rapid traverse to top of piece where next function repeats at the new cut depth.

The material has a Brinell hardness of 320, and the cut is made at 150 sfpm with a carbide tool ground to the shape of the thread.

Each pass takes 35 sec, of which 12 are devoted to cutting and 23 to repositioning the tool for the next cut. The complete threading operation takes 20 min—quite an improvement over the 88 min formerly required for cutting these threads on a thread mill.

And still, the tool is a flexible machine, able to perform, either manually or automatically, any work normally put on a vertical turret lathe, as well as the special rapid-threading operations.

In an effort to introduce this same flexibility into horizontal rapid threading, Alf Miller, project leader of the Machine Tool and Process Development Section, was assigned the project of designing an attachment that could be installed on standard lathes.

Since a lathe is capable of cutting threads with carbide tools, the goal was to automate the motions of the operator. The attachment that has been designed does this with a system of hydraulic cylinders, solenoids, and limit switches, plus a cam mechanism to establish cut depth.

The operator loads the part and manually positions the tool for the first pass. Then he presses the start button, and the automatic cycle takes over.

Here's how it operates

The first pass starts when a hydraulic cylinder engages the lathe's half-nut with its lead screw. These two parts must engage at the proper moment, so the function is under the control of a timing switch. The switch gets its signal from a pin on the threading dial of the lathe.

The cut is made in the normal manner, with the lead screw moving the carriage down the ways at a predetermined speed. At the end of the cut, the carriage hits a limit switch: the tool is withdrawn, and a series of hydraulic cylinders and limit switches disengages the half-nut, returns the carriage, and positions the tool for the next cut.

The return is quite fast, so the carriage is cushioned at the end of the stroke by a hydraulic cylinder with a small independent oil reservoir. The depth of cut is established by a cam which is operated through a sprauge-type clutch. This device is advanced for the next pass by the linkage that withdraws the tool from the previous cut.

As the unit is sequence operated—one action triggering the next—the only limit to the speed of operation is the length of cut on the workpiece. The electrical circuits are interlocked to prevent any lead error; the tool cannot move into the workpiece if the half-nut is not completely engaged.

The attachment still has to be proved out and debugged, but Watervliet hopes to produce a piece of equipment that will turn out threaded parts as fast as the special-purpose machines on the market—without interfering with the flexibility of a standard lathe.

In all probability, the device will first be patented for the Government and then made available to manufacturers.

As costs go up, ASTE discusses how to get . . .

More mileage for your tooling dollar

While the dollar has steadily decreased in value, costs of labor, materials and equipment have gone up. For that reason, American Society of Tool Engineers pegged its 27th Annual Meeting, Milwaukee, April 18-22 on "Planning for Profit" and devoted a special two-day seminar to the subject alone.

For instance, Carl M Beach, executive vice president, Heald Machine Co, told participants that "Manufacturers should spend this year's depreciation dollars for this year's equipment at this year's prices."

In his paper on "Capital Costs and You," Mr Beach pointed out that labor costs have risen 1000% since 1900, and with attendant increases in construction and equipments costs, a manufacturer who doesn't use his depreciation dollars to replace obsolete equipment jeopardizes his competitive position.

The same logic should be displayed, Mr Beach said, with regard to unprofitable production equipment as is used by a wise investor who sells unprofitable stocks and replaces them with new ones that have profit possibilities.

LIFO inventory pricing

Galen Taylor, vice president manufacturing, Koehring Co, described the "last-in—first-out," ("LIFO") method of pricing inventories, which reduces reported earnings, provides savings in tax payments, lower loan needs, and decreased interest payments.

Optimum inventory levels, Mr Taylor said, can be established by making use of comprehensive market information. He described a system at Koehring, where planning and annual capital expenditures are controlled by sales forecasts.

Another technique for controlling inventories was described by Erwin J Kaiser, staff vice president, manufacturing, Giddings and Lewis Machine Tool Co. This method analyzes the annual usage of general parts and the cost of setups for each operation, and the time required to process a part through the shop—among other factors that influence costs.

Research and development, according to H Dale Long, president, Scully-Jones & Co, result in improved or new products that add to the growth of a firm and provide one of the surest ways by which a company can keep up with—or move ahead of—competitors.

Manufacturing costs can be reduced with new products that cost less to make and are often better than previous products. Mr Long emphasized, however, that planned R and D programs (with close control) are necessary to provide direction or an outline of specific objectives and policies—as well as routines and procedures to be followed for the most efficient results.

Some key factors that control material costs were outlined by James B Purdy of Batelle Memorial Institute. With reasonable care in designing a product, he pointed out, materials that are difficult to process can be eliminated, or excessively expensive materials can be avoided. He warned listeners however, that selections of materials on the basis of low initial cost alone is dangerous. Consideration must be given to product life and performance, as well as to production problems.

Cost control in design was covered from two separate points of view by Lad J Boyer and Richard T Studer, both of Warner & Swasey Co. Mr Studer pointed out that the product designer is as responsible for economical manufacture as he is for the function of the product. And Mr Studer described a number of ways by which the designer can aid in holding manufacturing costs down. A "common parts book," for example, provides a list of all the parts common to the various machines made at Warner & Swasey.

Reference to this book eliminates re-designing them for each new machine in process. Other aids include lists of bar stock sizes, lists of commercially available parts, and standard radius and chamfer charts—as well as tolerance data that help a designer avoid specifying limits that require special handling.

If the design engineer's job is to achieve balance between quality and the cost of a product, the task of the industrial engineer, according to Mr Boyer, is to help the design establish that balance. Consequently, his work must be closely coordinated with design engineering functions.

Planned programs are essential in reducing manufacturing costs in quantity production, according to Robert L Witsche, general supervisor, mechanical engineering research, International Harvester Co. Such programs, he said, should include investigation and evaluation of materials, processes, techniques, and equipment.

New Developments

One of the most interesting of the papers describing new developments in metalworking covered use of copper-infiltrated metal-powder tool shanks, which provide excellent damping of vibration. Horace A Frommelt, Director, Metal Removal Center, Spring Garden Institute, Philadelphia, described these tools in a paper entitled "A New Approach to Machinability Determinations." With these metal powder shanks, both cemented-oxide and carbide tools provide greater metal removal rates, along with increased life and greater dimensional accuracy, he said.

Albert M Dexter, Director of Metrology, Pratt & Whitney Co Inc described the problems of measuring gage standards to ultra-precise limits. To achieve true standards, he said, we must have standards that are reproducible to as high a degree of accuracy as possible. Use of different wave lengths of light (determined by colors produced with a gas excited in an electric field) provide one of the most accurate means of measurement available. Of the three elements in pure gaseous form being considered for international adoption in defining the meter—HG 198, Krypton 86, and Cadmium 114—Mr Dexter expects Krypton 86 to be favored at an international conference in 1960.

Some of the design problems encountered in building elephant type machine tools were described by Walter L McCann, chief engineer, Giddings & Lewis Machine Tool Co, who identified such machines as "vertical boring machines capable of producing holes over 8-ft in dia; planer-milling machines with tables 60-in. wide, and planers with 96-in. wide tables."

Cost of such machines starts at $250,000 and only a few are built each year. They must be designed for a useful life of at least 40 years and still contain the most up-to-date developments, he said.

Radiographic inspection
simplifies quality control, reduces cost, and proves hidden defects. X-ray inspection room is at American Chain & Cable Co, Reading, Pa

Applied radiation performs for metalworking

When nuclear research is put to work at detecting, locating, and measuring jobs, that is applied radiation. It can be both powerful and sensitive, and it often does jobs that are impossible any other way. This roundup notes proven techniques, recent developments, and possibilities for the future . . .

By Charles Emerson, associate editor

Controlled radiation is a new tool that is just breaking into the ground floor of metalworking applications. Some 1600 industrial firms are licensed to apply radioisotopes. Now that the Atomic Energy Commission has earmarked $400 million for industrial isotope development, there is promise of accelerated activity in this relatively new field.

A good example of applied radiation is the recently announced "Cyclops" radiographic unit built by Picker X-Ray Corp and installed at Cooper Alloy Corp, Hillside, N J. It inspects heavy-wall castings for possible flaws with a radiation source of up to 1500 curies of cobalt 60, which is equivalent to a 2-megavolt X-ray unit. In spite of the massive concrete blockhouse in which it is installed for safety, the unit is less expensive than X-ray of equal power, and it uses no high-voltage power.

It produces conventional X-ray pictures on conventional film by sending out gamma rays from $\frac{3}{8}$-dia by 3/16-in.-long slugs of cobalt 60, which is a synthetic form of the element, produced by bombarding the cobalt in a cyclotron. The cobalt is held in a crane-mounted head with a remote-controlled window that can be retracted to expose the cobalt to the castings. Radiation penetrates the metal to produce pictures on X-ray film located behind the casting walls. For special-quality castings, 100% inspection is required, so exposures from all angles are made over a 40-hr period.

The same kind of inspection is performed with a similar source at National Supply Co, Toledo, where welds in alloy-steel castings are checked (see cover). In this case, however, the cobalt 60 is handled at the end of a long aluminum rod, and is placed inside each casting. X-ray film is strapped to the outside of the casting to pick up radiation from inside. The cobalt 60 source is of much lower power than the Cooper installation, and the length of the rod puts enough distance between operators and the source to make it safe.

Radioactive sources are usually handled by simple mechanical devices to insure reliability—adjusting or repairing them may be dangerous if the source is exposed. One common handling device is a flexible metal tube through which cobalt slugs may be cranked out from a shielding container to a location next to the work to be irradiated.

Inspection without X-ray film is

possible, too. A new method just announced by the Naval ordnance laboratory checks ship welds instantly. A shielded scintillation counter is moved along a weld line with a radioactive source. Any voids in the weld reflect radiation back to the counter—much like radar or sonar action. Good welds without flaws will not reflect above a certain level, so flaws are indicated only when the counter triggers.

This system is sensitive enough to indicate flaws as small as 4% of thickness of the weld. Inspection speed is 1000 ft of 1-in.-thick weld in about 11 hours.

Tracer Tests

Most present-day applications for radiation are connected in some way with inspection, but inspection is applied for a number of purposes. For example, Cincinnati Milling Machine Co has conducted tool-wear tests for a number of years with applied radiation. The technique uses a tracer—a radioactive element in relatively low concentration that can be detected after it has moved. The metal-cutting tool is exposed to radiation, then installed in a test machine setup where a sample part is machined for a specified time—usually only 6 seconds. As the tool wears, particles of irradiated cobalt, tungsten, tantalum, and chromium in the original tool are worn away. These can be detected in the chips (the coolant has been proven to collect only around 5% of the tool material) to indicate relative wear.

Indexing bits with four cutting edges are applied at a shielded lathe where the tools and work are handled by 4-ft tweezers—for operator safety. Radioactive materials are buried in specified locations after the tests are completed. Results since 1950 show that these tool-wear tests are accurate within ± 10%, which is considerably better than the conventional 30% with direct measuring methods. Tests are made in 4-8% of the time usually required, and costs are low. An investment of $5000-10,000 is enough for laboratory facilities, inspection and safety devices, and tool-handling and storage facilities. Returns are high; in machinability data and comparisons between tool materials. It is estimated that at least 10% can be saved in machining costs, and that many routine machining operations can be slashed 50%. One feature is that the short test is always made with a sharp tool, so results are more valid than with other tests.

Other kinds of wear tests have been made with radiation. The same general technique is applied to engine cylinders to find out how and why cylinders and piston rings wear. A piston ring is irradiated, then installed in an engine that is operated for a standard length of time. "Hot" particles from the ring are worn away to fall into the engine oil, and also to be deposited on the cylinder walls. Inspection of the oil and cylinder with a detector shows how much relative wear occurred. Ring materials, cylinder metals, and lubricating oils can all be tested this way.

Tracers are usually low-level and short-lived radiation devices. Depending on which element is made radioactive, the material may be "hot" for a long time, or only for a few hours. There is one example of short-lived radiation in the case of sodium-filled engine valves. The sodium was irradiated so the plant could be sure that all valves were filled. However, the half-life of the radiation was only 15 hr, so work had to be completed the same day.

Half-life is a common term in nuclear engineering—it indicates the time it takes for the original radiation level to die down to half strength. Strength ebbs in a geometric curve—never dies out completely—so a cutoff point is required. After half-life, the material can be irradiated again.

Many Uses

Other tracer applications have been made to determine wear on friction surfaces. Gears have been checked under standard conditions with several lubricants to determine the most effective oil. This has been done by irradiating a gear or a set of gears so worn particles can be detected in the oil after the gears run a standard length of time. However, this method requires radioactive material in the laboratory and plant.

Another system that keeps radiation out of the plant is possible, and has been reported by General Electric Co. A main gear in which there will be wear is analyzed to find an element in the metal that is not present in the other gears and shafts in the mechanism. After the mechanism has been operated a controlled length of time, the oil in the system is removed and irradiated in a laboratory. Radiation from the exclusive element can be detected, and the total amount of that element in the oil can be inferred. Comparative tests with several lubricating oils can be made, and results checked against each other. In this way the most efficient lubricant—which produces the least wear—can be found. This technique is called neutron activity analysis, and may be applied in many other cases.

Tracers are now applied in many industries for many reasons; at one time garbage in Los Angeles was traced to Santa Monica Bay with a radioactive tracer; and sand and silt have been traced in the River Thames, London. Trace elements can be developed in minute quantities so that even a city's water supply can be checked to answer questions about rate of flow.

Other applications of radiation include these: Thickness gages are operated with direct radiation to check the amount of silver plated to the inside surfaces of wave guides (neutron activation). Plating thickness as thin as 0.0001 in. can be detected. Sheet-metal thickness can be gaged because a metal located between a source of radiation and a detector instrument will reduce the flow of gamma rays that contacts the detector. Engine deposits can be gaged by inserting an irradiated plug in the cylinder head, then measuring the radiation level of the plug. Fouling engine deposits on the plug absorb some of the radiation. A quick test of this sort can save hundreds of hours of engine running required for more conventional measurements.

One source can be set up to do multiple radiographic inspecting, which is a method of reducing costs. Unlike an X-ray tube, which throws radiation in only one direction, a radiation source can be exposed on all sides. If a number of castings to be inspected are arranged in a circle, the source can be placed at the center to produce X-ray films of all castings simultaneously.

Applied radiation is perhaps better known in plastics and other fields at the moment than in metalworking. A number of plastic materials are irradiated to improve strength and durability—in fact to change their physical characteristics completely. Foods can be prevented from spoiling by irradiation; drugs can be sterilized to make them safer, and even chemical reactions can be started and controlled with radiation.

Applied radiation is obviously a specialized tool—and many plants prefer to send out their materials or parts for processing at a laboratory that is experienced in radiation techniques. But radiation is also a tool that appears to have a great number of possibilities for the future.

New ideas in machine tool controls

"America is pricing itself out of the world market," Ralph J Kraut, president of the National Machine Tool Builders Assn, said at the 23rd Machine-Tool Forum, sponsored by Westinghouse Electric Corp, in Buffalo. Mr Kraut pointed out that this danger exists because productivity is not keeping pace with costs.

The United States is losing its once valuable export markets at an accelerating rate, at a time when world industrialization offers our capital-goods industries the greatest potential market in history. Unless something is done to offer substantially more product per dollar, even if it means devaluing our dollar, this country will lose our leadership as an industrial supplier to the world and will forfeit a major portion of its domestic market to foreign imports. Protective tariffs might provide some temporary relief but won't cure the disease. And they will further weaken U S foreign markets.

Cost-output imbalance can be corrected in two ways, Mr Kraut said. Labor either can do more work or work more efficiently per dollar of wage, and the productivity of manufacturing equipment can be raised.

Almost every paper presented at the Forum described technical developments offering more product per dollar. Much of the meeting centered around equipment control techniques and problems, with emphasis on output and reliability.

Controls are critical

In an analysis of limit switches vs proximity switches for machine tools, John M Morgan, Jr, manager of The Cincinnati Milling Machine Co's Development Research Dept, described his idea of the ideal contact-making device. To meet most requirements this ideal device should be: completely reliable, foolproof, simple, failsafe, fast operating, positive, accurate, small in size, low in cost, easy to mount and wire and suitable for use in all environments. In addition it should have an adequate number of contacts, adequate power-handling capacity, snap action, small differential, low operating force, ability to sense without contact and it should provide ample overtravel.

Unfortunately, said Mr Morgan, no contact-making sensing device ideally suits all of these specifications. Limit switches meet many requirements, and so do proximity switches, including vane-operated limit switches, but neither is universally applicable. Meanwhile, improperly selected or applied limit switches are a major cause of machine-tool and process downtime. Even with the standardization of limit switches, it is necessary to use different limit switches for different jobs to obtain best results.

At present there has been no standardization at all of proximity switches, for either sensing elements or control units. Provision must be made to suit the particular unit used.

Complexity a factor

As the degree of mechanization increases, limit and proximity switches become an increasingly important factor. Some machines literally use hundreds of them and the reliability factor can become critical. Even when static switching replaces relays, the problem exists. John Zambrzycki of Ford Motor Co's Engine Manufacturing Engineering Section pointed out that static systems or relays notwithstanding, the weakest point in most machine-tool systems is the input—the limit switches, proximity switches, and other sensing devices. Coolants, for instance, are a frequent cause of failure as they enter the switches and create shorts. In some cases a good seal against coolant is finally obtained and then someone introduces a coolant containing a wetting agent and the problem starts all over again. Much can be done to improve the reliability of these components by careful selection and placement in relation to the machine's function.

Direct-current, variable voltage drives are becoming increasingly practical for use on the smaller machine tools, to provide constant horsepower, according to W A Means, project engineer, Machinery Development, Barber-Colman Co, Rockford, Ill. Improvements in the cost and size of these devices are resulting from the rapid development of semi-conductor rectifiers such as the silicon or germanium rectifier.

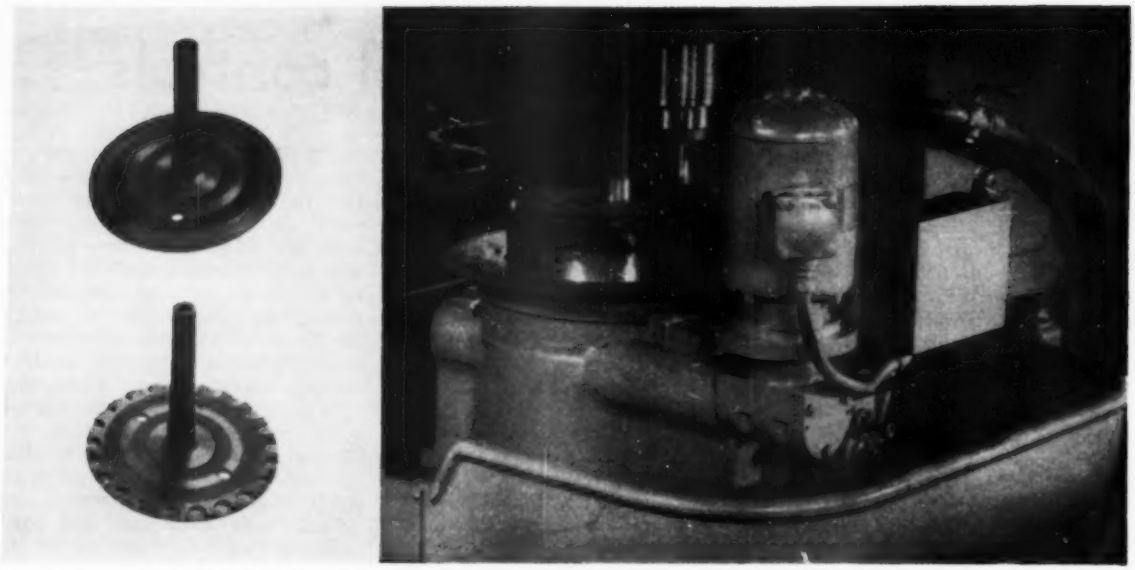
Recently, a variable voltage drive using a combination of variable autotransformers and silicon rectifiers was developed for the Barber-Colman 9-in. tool- and gagemaker's lathe. Basic requirements included: (1.) A 3-hp rating with maximum hp over as wide a range as possible. (2.) Drive should be a combined control using a dc shunt motor, with field and armature control adjustable from a common shaft. (3.) Power supply components sufficient to permit operation at 200% of capacity for short intervals. (4.) Control should be simple and involve no electronics; should use only equipment that is familiar to and easily understood by maintenance personnel. (5.) Control should be rugged enough for production toolroom service while mtaintaining performance required in precision tool and gage making. Good regulation of the dc motor was achieved by compensating for the IR drop by adding an additional ac voltage to the ac voltage supplied to the rectifier from the variable autotransformer.

New power control

The Silicon Trinistor Triode is a new static ac switch described by Westinghouse Electric Corp's Materials Engineering Dept. This semiconductor switch is a three-terminal device which might be considered as a semiconductor thyratron. It lends itself to static ac switch circuitry in any application where a large alternating current must be controlled by a relatively small input power level.

Trinistors, still in the development stage, can be used as output devices for static logic systems in use today and would be many times smaller than magnetic amplifiers capable of switching the same loads. In time this static ac switch may be used to drive large inductive loads directly, eliminating the need for contactors and interposing relays. Initial breakover voltage in the forward direction can be as high as 500 to 600 volts; the reverse voltages of the device are in excess of the forward breakover voltages with zero base current.

Computer control of roll forming equipment was described by Chas W Thomas, Asst Sales Mgr, The McKay Machine Co, Youngstown, Ohio. Digital length-measuring equipment replaces mechanical sequence and length control, to greatly enhance the versatility of the process. Now, instead of long production runs being necessary to offset the cost of setup and adjustment, short runs and alternate lengths are entirely practical due to the new control.



1. . . Magnetic clamping helps mill 22 slots in flange of this thin section part

Magnetic chucks make easy-to-use

Magnetic chucks, a useful metalworking tool for more than half a century, are today finding a new job. As holding fixtures for machine tools, they are helping tool engineers to overcome many present limitations in fixture design, and at the same time they are cutting down considerably on setup time for a wide variety of operations.

For instance, as Sundstrand Machine Tool Co's Frank L Suchanek said in a paper presented at the Westinghouse-sponsored 23rd Annual Machine Tool Electrification Forum, April 14-15, magnetic-chuck clamps can cut operator motions tremendously. He showed two photographs, taken with open shutter, of an operator with a light attached to his wrist.

The number of motions required for the operator to load a rectangular bar against alignment stops and then clamp the part to the machine table with three straps and bolts produced a spaghetti-like effect on the photograph. Loading of the same part onto a magnetic milling fixture, on the other hand, produced far fewer motion-tracing beams of light.

Sundstrand has built several such millers, equipped with a 12-ft-long magnetic chuck, for manufacturers of heavy shear knives. One, a 50-hp mill so equipped (see Fig. 4) cut loading and clamping time by 75%, as against mechanical clamps. At the same time, cutter life was greatly improved, and speeds and feeds were increased.

When a part is clamped magnetically, Mr Suchanek said, every molecule in the piece is theoretically influenced by magnetism. This means more uniform distribution of holding force, less vibration and chatter and, of course, improved cutter life.

Magnetic holding force can be improved, Mr Suchanek added, by taking the thrust from the table feed and cutter against a mechanical stop that is *not* attached to the magnet frame. So arranged, the fixture allows the magnet to function more effectively as a registering device with maximum rigidity.

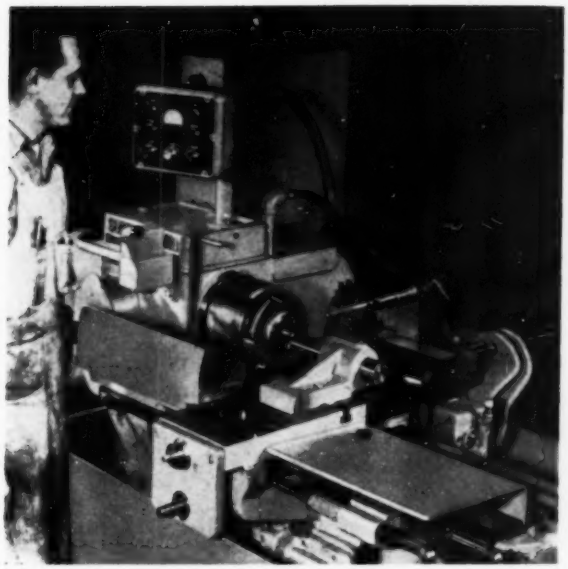
Another 50-hp mill equipped with a magnetic fixture (see Fig. 5) face mills all sides and ends of die blocks. Here again the mechanical stop (for aligning the piece) and the stop for the thrust are independent of the magnet frame. Control of the magnet is from the machine pendant, and interlock insures that the motor cannot be energized unless the magnet is on.

In another application, Mr Suchanek pointed out that a magnet not only eliminated an accuracy problem, it improved loading and clamping time. Here, a combination magnetic and mechanical fixture performed operations on a transmission housing. Magnetic holding was available in both horizontal and vertical planes and the part was milled on a special Triplex Rigidmill. This job was originally held with four tunnel-type mechanical clamping fixtures—so heavily that the piece distorted.

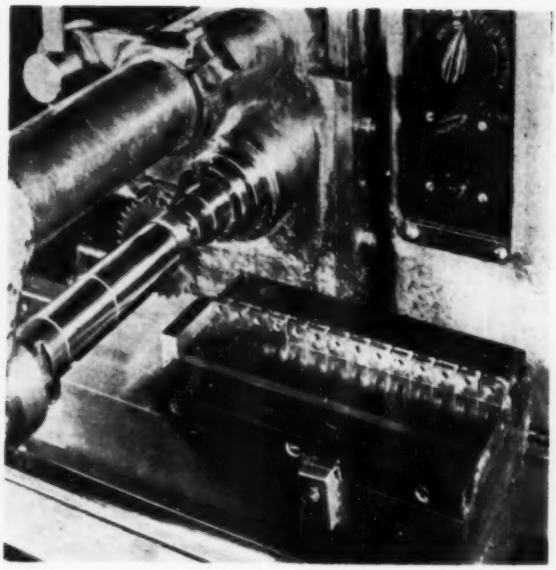
With the new method, the housing was located by two dowels in the horizontal magnet. Then the vertical magnet was adjusted so that it registered against the side surface. Results: no more distortion, parts milled within 0.0005 in. total indicator reading for parallelism.

As shown in Fig. 3 a small (⅜ x ⅝ x 5/16 in.) part through which an 0.090 in.-wide x ½-in.-deep slot had to be cut was originally held in a vise which didn't grip properly and frequently pinched the slotting cutter. Here, a maximum of tractive force was achieved by arranging the magnetic poles so that the holding force was directed through one side and the bottom surface of the part. The magnetic fixture handled 14 parts per load with a feed rate of 13 ipm. Cutter life between sharpenings averaged 30,000 parts.

Fig. 1 illustrates an unusual magnetic holding application for a thin-section part (18-in. diameter, turned all over, with two cored holes, and a finish-bored stem base). Operation involved end milling 22 slots around



2 . . . Rotary chuck on production lathe



3 . . . Slotting 14 parts on magnetic fixture

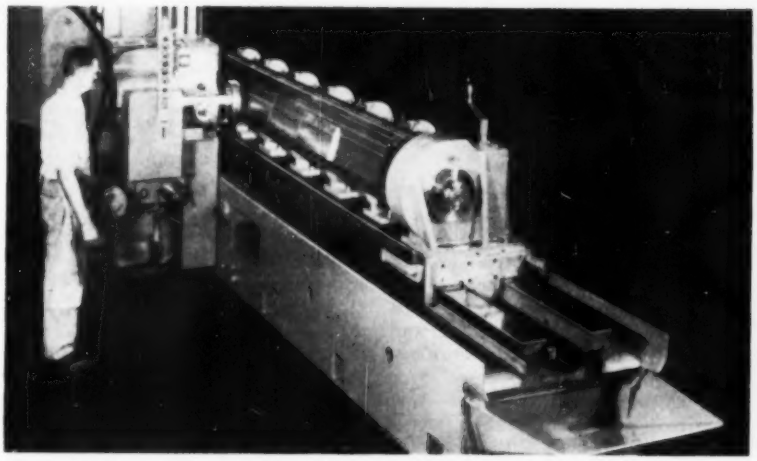
clamps

the top surface of the flange, holding depth of the slots within ± 0.0005 in. with respect to the bottom of the flange. To do the job, the fixture was applied to a vertical milling machine fitted with a rotary magnet.

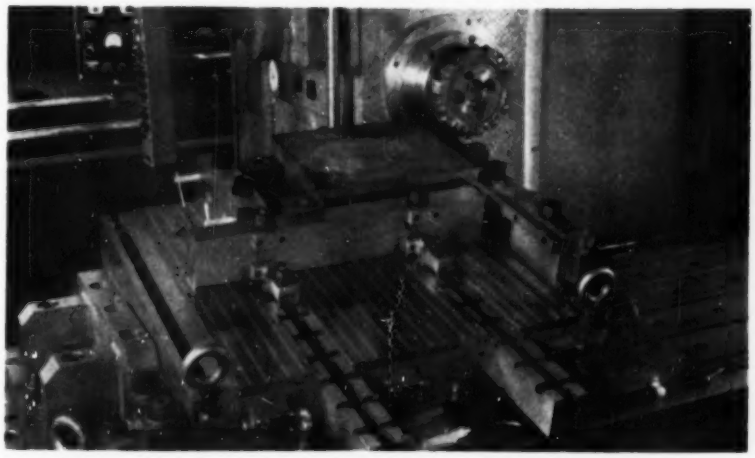
The part was loaded over a pilot in the center and located radially from a pin into one of the holes. Production averaged 19 pcs/hr at 80% operator efficiency.

A production lathe fitted with a rotary chuck (Fig. 2) makes facing and boring cuts on a clutch plate. Direct current is applied to the magnet by a collector-ring brush assembly mounted at the rear of the headstock spindle. Wiring is through the spindle to the center of the magnet. Here, the three top plates (each of which holds a part) are cheap and easy to make, and the operator can change them on the base magnet in less than 5 minutes. The magnet is fitted with a hard pilot bushing in the center, and the top plates have a hardened pilot in the base so as to maintain the fixture element's concentricity.

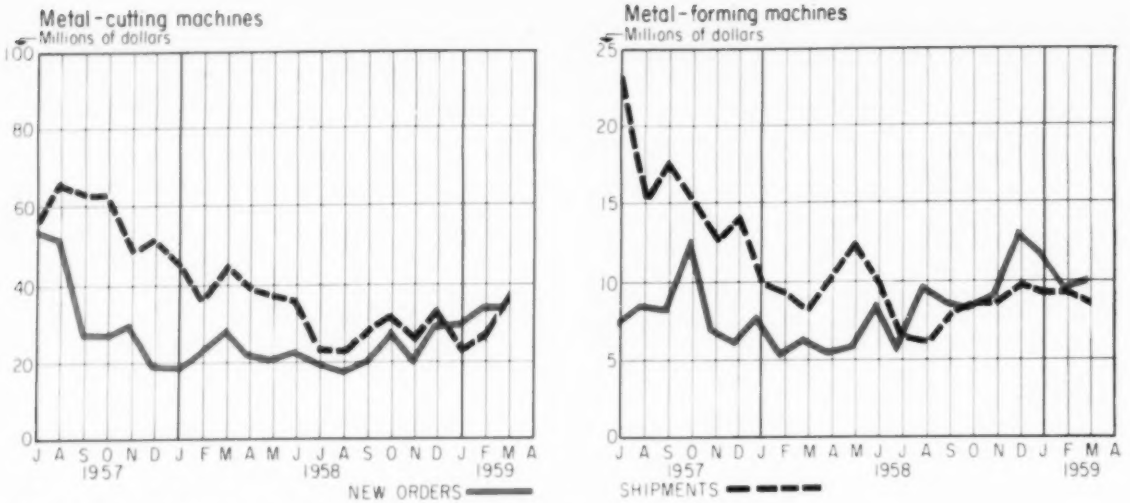
What does magnetic fixturing cost? About the same as air-clamping fixtures, according to Mr Suchanek, but he adds that savings in operator effort, improvements in tool life, and high production accuracies combine to give magnetic fixturing a definite edge over air-clamping.



4 . . . 12-ft-long magnetic trunnion fixture on a 50-hp Rigidmill



5 . . . Milling die blocks on a magnetic fixture with a Rigidmill



Machine tool orders and shipments rise in March

Shipments of metal-cutting machine tools rose sharply in March to $38.3 million, as net new orders continued their gradual climb from November low levels. Orders for metal-forming machines also increased, to $10.55 million in March, but shipments dropped off to $7.85 million (Preliminary NMTBA figures)

Machine tool builders and users get together to...

Overhaul JIC hydraulic standards

More than 75% of the hydraulic standards for machine tools adopted by the Joint Industries Conference in 1953 have just been revised to keep pace with advances in machine tool design, to take into account increased use of hydraulics in automation, and to simplify and modernize definitions.

The drastic revisions came to a head last month when some 150 machine tool builders and users from a wide variety of metalworking industries met in a three-day Joint Industries Conference to take action on recommendations made by such prominent machine tool users as General Motors, Ford, Chrysler and International Harvester.

80% of comments accepted

Approximately 80% of the resulting comments from machine tool builders, makers of pumps, valves, cylinders, fluids, packing and other hydraulic equipment have been incorporated into the new revisions.

Graphic symbols

Adoption of ASA standard graphical symbols for use with current standard hydraulic diagrams was one of the more significant additions made to provide additional details of circuitry, and to improve diagrams for quotations, piping an installation, and for analyzing circuit operation. The new symbols are also expected to be advantageous, for example, in diagramming individual stations of a transfer machine.

Welded steel tubing

Another important addition was new standards for welded steel tubing covering chemical composition, mechanical properties, dimensions, quality, packing and marking and inspection. Four new paragraphs were added to the section on safety. These provide for manual controls for operators exposed to equipment movement hazards; maintaining depression of the manual control until a point in the cycle is reached where the hazard is removed; location and guarding the controls so that both hands are required in their operation; and circuit design to prevent operation of the equipment unless both controls are released by successive operations.

Magnets in reservoirs

Also of importance was the addition of a standard requiring the use of magnets in the reservoir of a hydraulic system. These must be of sufficient strength and quantity to pick up magnetic particles not retained by strainers and filters. Provision was made to insure proper location and support of the magnets as well as removal for servicing.

Fluid power glossary

A glossary of terms developed by National Fluid Power Association was considered for addition to the current JIC glossary. A special committee including representatives of NFPA and the Hydraulic Sub-Committee of the National Machine Tool Builders Association was formed to study and revise the 1953 glossary in light of the additional data. An appendix of especial significance was added to facilitate design and use of piping, tubing and fittings. These data were tabulated to show the flow rate in gpm obtained with valves, piping and tubing of specific sizes for operating pressures of zero to 1000 psi and also for operating pressures of 1000 to 2500 psi.

Other revisions

Other revisions included changes to standards on hydraulic controls, pumps, piping and fittings, fluid reservoirs and valves among others. Considerable care was exercised by both builders and users in revising the standards to avoid limiting freedom of design or restricting new developments in hydraulic circuitry.

More freedom for machine tool designers?

Welding opens up some new fields

Entirely new concepts in machine-tool design may develop as a result of current advances in welding technology. Other fields, too, will feel the influence as welding's effectiveness is increased by new principles and processes aired at the American Welding Society's Annual Meeting and Show in Chicago.

When the full benefits of welding are applied in designing a lathe, economical manufacture is only one of the advantages, according to a paper delivered by G M Sommer of Clearing Machine Corp. Even more important is the added flexibility of design that is no longer limited by casting technology.

Because of this new freedom, the bed, the pedestals, and the chip pans of Clearing's new lathe were combined into one integral structure. Another radical departure is the construction of the headstock. It rests on the floor and is flange-mounted to the bed. And a modular driving mechanism is a further innovation that would not have been possible with cast design.

Russian electroslag welding

For welding the heavier members in machines of the future—or other particularly thick joints — manufacturers in this country will have access to the Electroslag welding process developed by the Russians and now imported here by Amalgamated Industrial Corp of Philadelphia.

The process will butt weld steel plates in thicknesses from 1 in. up to 10 in. or more. Square-edged plates are aligned vertically, with a gap between them that depends on their thickness. A block closes the bottom of the gap, and water-cooled copper shoes close the sides.

Granulated flux in the cavity is fused into a molten slag by an arc from the electrode wire. But once the process has started, there is no more arc. The flux is kept extremely hot by the current flowing through it, and this heat melts the electrode at the rate of 30 to 40 lb per hr. As the weld metal builds up and solidifies from the bottom, the machine moves the wire-feed nozzle and the shoes upward.

At the other extreme, are new developments for welding thin mild-steel sheet with the inexpensive, CO_2-shielded process and for out-of-position welding with the CO_2 shield. These welds were formerly impossible because of the "hot" arc required for efficient, spray-type transfer of metal from the electrode to the weld puddle.

The heat gives deep penetration, which is fine for heavy welds but is apt to burn right through thin sheet metal. Too, it makes a soupy weld puddle that is pactically unmanagable in vertical and overhead welding.

Both the Westinghouse Dynamic Reactor, previously reported (*AM*—Nov 3 '58, p89), and Airco's new Dip Transfer process solve the problem with special power supplies that give a spatter-free metal transfer at much lower power settings. Though especially useful for thin sheet metal, both methods are applicable to heavier work, as well.

Airco states that its process transfers the metal only during short-circuit conditions, when the electrode actually dips into the weld puddle—hence the name, Dip Transfer. These short circuits, occurring at a steady rate as high as 200 per second, produce a pulsing arc rather than the stable arc found in conventional techniques.

Resistance butt welds

Also in the thin-gage field is a process that makes butt joints in sheet metal by resistance welding. It's another imported method (Peco Foil Butt Seam Welding Process), and Precision Welder and Flexo-press Corp of Cincinnati is exclusive licensee (*AM*—June 30 '58, p73).

The table of the machine consists of two magnetic chucks. One sheet is located against gage blocks, and the second is lined up against it with the seam centered under the water-cooled, copper-wheel electrodes.

Foil strips made of the same material as the sheets are supplied from coil cradles above and below the weld. They are fed between the wheels and become an integral part of the welded joint.

During the process, the strips act as a bridge, distributing the current to both sheets and helping to contain the weld nugget as it grows and cools. Steel sheets from 0.020 to 0.250 in. thick can be welded at speeds of 3 to 24 fpm, depending on thickness.

In aluminum, too, welding has made large steps forward, in both heavy and light gages. R. L. Hackman of Linde stated in a paper that the recent use of higher welding currents for aluminum plate will mean significant cost reductions in plate-edge preparation and in the welding operation itself.

For example, 1½-in.-thick plate to be welded by the Mig process (consumable-electrode, inert-gas) now has to be carefully beveled on the edges. During welding it usually takes three passes from one side, and after back chipping, three passes from the other.

High current cuts costs

However, with the higher current levels, the job can be done with one pass from each side—faster passes, too. Edge preparation is simpler, and back chipping is eliminated.

In light-gage aluminum, the Mig process is using welding wires down to 0.030 in. in dia and high arc-travel speeds. "With constant potential power, these wires make it possible to weld aluminum under a new range of welding conditions not possible heretofore . . . [and they] simplify the control problem for automation."

In welding the aluminum-magnesium alloys, the Army Ballistic Missile Agency has found that Tig welding (tungsten-electrode, inert-gas) is better than Mig welding, that it produces welds with superior mechanical properties.

D. M. Daley, Jr. states in his paper that maximum weld quality depends upon "(1) proper material cleaning techniques, (2) optimum welding conditions, and (3) adequate tooling and fixturing."

The joints must be mechanically clean, and they must stay clean until the welds are made. Optimum conditions call for fully automatic welding wherever possible; tensile properties are at least 10% greater than with manual welding. Adequate tooling, too, makes better welds. "Proper control of the backup-bar groove configuration, hold-down pressure, and tooling fitup are among the more important considerations investigated during this study."

11 steps to better cutting-tool performance

Real metalworking know-how—or lack of it—shows up in the way a cutting tool behaves during a cut. Here are the elements of success or failure, described by a man who has both taught shop practice and worked in many different manufacturing capacities

By **Frank J Sherman,** senior consultant
H B Maynard & Co, Inc, Management Consultants, Pittsburgh 21, Penna

Cutting performance of a tool mirrors, in varying degrees, most of the incompetencies and inadequacies that have preceded its actual application to the work. Succinctly, the cutting edge is the focal point of all the thinking and planning for the entire operation. If any single element is short changed, tool performance will suffer.

Too frequently, time pressures limit even skilled planners to considering only a few of the many possible pitfalls. Machines go into action, and the machine operators are swamped in an almost endless series of production difficulties.

As is readily demonstrated by the Carboloy computer, all of the variables involved in using a cutting tool are interdependent; all must carry their share of the load. Thus, none of these elements can be ignored. One way to avoid overlooking a significant factor is to prepare a checklist, which incorporates 11 important considerations:

1. What are the *production, accuracy* and *finish* requirements?
2. Which *cutting-tool material* best suits the job?
3. How *machinable* is the work material?
4. How much *stock must the tool remove*—how quickly?
5. Are *machine condition and flexibility* suitable for job requirements?
6. Will *cutting pressures* be continuous or interrupted?
7. How *rigidly* can the *tool* be held?
8. How rigidly can the *work* be held?
9. What *angles* should be *ground* on the cutting tool; is a *chipbreaker* necessary?
10. Will the work be cut *wet or dry*?
11. What combination of *speed-feed-depth of cut* is best to provide *optimum tool life* while fulfilling the *production, accuracy and finish* requirements of the job?

Thoughts that emerge from careful consideration of the many variables embodied in a systematic attack upon the cutting-tool problem are:

The best solution is a carefully weighed compromise.

Each compromise recognizes the practical significance of *all* 11 job environment considerations to be discussed.

Each compromise must carefully evaluate each principal consideration against each of the others, to determine accurately the *relative importance* of all the considerations - - - in *that* shop, on *that* model of machine tool, for *that* kind of operation, for those specific production, finish, and accuracy requirements.

1. What are the production, accuracy and finish requirements?

Consult - - - Sales, Estimating, and Engineering as required. Learn the exact specifications needed by the customer, and resolve each requirement into production accuracy and finish.

Set - - - a specific goal for each commitment. Express each goal in terms of easy-to-measure and objective units; for instance, pieces per hour for production, or micro-inches for finish, or 0.005 in. for accuracy.

2. Which cutting-tool material best suits the job?

Selection of a cutting-tool material precedes all directly productive activities. Practically any of the many available cutting tool materials has its own special "job environment" and in this job environment, a tool will give a very creditable account of itself.

"Job environment" for a tool material is an intricate interrelationship of many individual job variables. No tool is truly "ready" to do its best work unless its own physical characteristics—the overall effect of its own hardness, malleability, tensile strength, critical temperature, grind —blend successfully with the physical characteristics of the machine tool, the work, the work setup, and the tool setup.

Physical characteristics of the machie tool very ofter. limit the productivity, smoothness-of-finish and accuracy capabilities of the cutting tool. Snug bearings and gibs permit faster and heavier cutting, smoother and more accurate finishes. Unduly

worn or maladjusted bearings or gibs force the operator to go slower, to avoid chatter and chipping or breaking of the tool; smoothness and accuracy suffer, too.

For optimum tool performance, the work must be rigid. If need be, relatively "limber" sections of the work (frail casting, weldments, and similar structures, comparatively lacking in ability to resist bending and torsional stresses) must be reinforced with suitable setup devices, properly located for maximum reinforcement. In fact, both the work and its setup must provide a high degree of resistance to the cutting forces. Without this rigidity, the cutting tool cannot do its best work.

The "job environment" of the cutting tool must include correct setup of the tool. Tool setup is correct only when it combines successfully with the tool grind to present the cutting edge to the work at the correct angle for that particular material, speed-feed-cut combination, and operation. Each setup should include minimum clearance without excessive friction; minimum over-hang without undue operational restrictions and easy get-away for the chips.

In effect, a really accurate initial selection of a cutting tool material entails a close study of practically all of the significant factors of the operation. Machine conditions will determine some limits for using the harder carbides, as will a part calling for interrupted cuts. Ceramics may be eliminated by a lack of sufficient surface speed. The planner must be familiar with the characteristics of many different grades and forms of tool materials.

3. How machinable is the work material?

"Machinability" generally is a measure of the ease of stock removal. Broadly interpreted, it reflects all of the theoretical and practical considerations necessary for the achievement of optimum cutting-tool performance. Here, we restrict the connotation to the physical and chemical characteristics of the *work material* only. As a general index of the machinability of the work material, use *either* the *hardness* or the *tensile strength*, whichever is available, then stick to the one you select.

Machinability of the work material can, and usually does, significantly affect decisions concerning most if not all of the other considerations awaiting our attention. Specific rules would be impractical, but we can be sure of a trend: Other factors involved in machining materials of poor machinability become *increasingly critical* as machinability decreases. And conversely—other considerations concerning materials having good machinability become *increasingly easier to control.*

4. How much must the tool remove —how quickly?

In general, we plan to remove all the stock in as few cuts as possible. Within existing limitations (tool size, imminence of chatter, rigidity of setup, etc), we strive to do *all* the roughing in *one cut*, and all the finishing in *one cut*. With small amounts of stock, we frequently combine roughing and finishing cuts into one operation.

In turn, resolution of the depth of cut through stock measurement paves the way for a practicable selection of a feed-speed combination that satisfies production, finish and accuracy requirements.

However, depth of cut may also have to take into account machine condition or rigidity of setup. Even on work where a single pass might rough and finish to complete the operation, poor operating conditions may necessitate a rough cut and then a slight clean-up cut within the tolerance capability of the machine.

Also, is the operation keyed into a cycle? How much is an increased rate of metal removal worth? A more expensive tool material,, or shorter tool life, might prevent a bottleneck—or it might mean that the machine stands idle until other operations catch up.

5. Are machine condition and flexibility suitable for job requirements?

Snugness of bearings and gibs permits relatively loose tolerances in tool grind and setup, in rigidity of work setup and in the choice of a feed-speed-cut combination. Worn bearings and gibs decrease the "leeway" allowable for other factors and precipitate inefficient experimentation and compromise.

Flexibility of the machine depends to a large extent upon the number of speeds and feeds available to the cutting tool, and upon the spacing between adjacent feeds and speeds. Broad flexibility of feeds and speeds increases the "leeway" for the setup, tool grind, and so on. A narrow choice of speeds and feeds limits the caliber of tool performance to only a fraction of its potential. Similarly, the availability of constant surface speed avoids inefficient compromises on tool angles and cutting speeds.

6. Will cutting pressures be continuous or interrupted?

Sudden changes in cutting pressure cause impact and shock. The severity of impact depends primarily upon the "angle of approach." *Angle of approach* is the angle between the thrust face of the cutting tool and the contacted surface of the work. A 0° approach angle gives maximum impact; a 90° approach angle results in a negligible change of cutting pressure.

An interrupted cut causes an instantaneous change of pressure from zero to maximum. During a continuous turning cut in a lathe, cutting pressures are practically constant because the approach angle is about 0° (tangent) at the instant of initial contact of tool and work. At the instant a shaper tool enters the work, to sever a chip, the approach angle for all practical purposes is 90°; the meeting of the tool and the work, which results in readily apparent impact. For the rest of the work stroke, however, the approach angle is close to 90° and the impact is negligible.

7. How rigidly can the tool be held?

Tool setups can be largely management-controlled or largely operator-controlled. The choice is up to management.

Ordinarily, setups controlled largely or completely by management will be systematized and will reflect careful and thorough investigation of most of the necessary elements. These setups will be comparatively rigid.

Conversely, setups left largely to the operator will be primarily experimental in nature—almost invariably, rigidity of the tool steup will suffer. This, in turn, establishes a series of compromises: The tool grind becomes more critical, imminence of chatter demands repeated sacrifices in the speed-feed-cut combination, tool life suffers, and accuracy may be at stake.

Also, the planner must select the design of tool holder; whether clamping will be mechanical or tip will be brazed. How will cutting pressures be distributed back through the holder into the machine? Does the length of the tool holder call for more rigidity? Would tungsten, or even beryllium, prevent chatter or give that last 0.0001 in. of accuracy?

8. How rigidly can the work be held?

Again, management-controlled setups tend to be more systematic, hence

more reliable and efficient. In general, rigidity of both the tool and the work steup comprises one of management's most formidable challenges. Practical achievement of the potential economic effectiveness of the captial investment is impossible without *skilled* and *well-planned setups*.

A great deal of unnecessary and costly experimentation follows the usual "cut-and-try" approach. When shop conditions are loosely controlled, the dollar result obtained is apt to yield far less than the true potential benefit.

Planners must decide whether to use simple clamping, power clamping, fixtures, magnetic chucks, etc. Will clamping distort the work? What happens as the piece heats? Are cutting loads spread out or focussed at one point? How will fixture withstand frequent loading and unloading? What will all of these factors do to the relationship of the tool and the work?

9. What angles for the cutting tool; is a chipbreaker necessary?

Tool setup is *inseparable* from tool grind; ineffectiveness of *either* can nullify even a very fine job on the other. For this reason, it is false economy to establish comprehensive control of the tool grind, without a concurrent and equally intensive effort to tie down the tool setup procedure. Metal removal rate, too, relies *directly* upon the effectiveness of the tool grind and seup. Failure to "treat the tool right" on *both* counts can result in, at best, only a poor showing.

Lack of properly engineered tool grinding and setup has led to costly and numerous instances of:

Tool failures

Wasteful, indiscriminate sampling of various types and grades of cutting-tool materials—without any concrete, reusable result.

Complete consternation of shops supervisors

Costly compromises in job procedures

10. Will work be cut wet or dry?

When the tool is apt to exceed destructive temperature from the frictional heat of cutting, or when the work material is excessively abrasive, cutting fluid in some form helps the cutting tool to cut faster, longer, with more consistent accuracy, and with smoother results. Careful analysis of the specific operational environment—activity, machinability, speeds and feeds available, and so on—will reveal the economic feasibility of applying cutting fluid.

Use of a cutting fluid, however, never should be casual. The content and nature of the fluid is as definite a factor for selection as the tool angles or the tool material. Select the best compound to provide the necessary characteristics — cooling, lubrication, corrosion prevention, or a combination. Is mist or CO_2 gas better than fluid? Should the fluid be refrigerated—or warmed to maintain a close tolerance? What flow rate is necessary to remove all of the heat? What degree of filtration is necessary, for optimum tool life, to keep fluid clean? With this kind of question, cutting fluids are scientifically selected.

11. What combination of speed-feed-depth of cut?

After each of the other principal factors is weighed, determination of a highly productive yet trouble-free feed-speed-depth of cut combination is the final step; a *careful and realistic* resolution of all of these considerations.

Metal removal rate of the feed-speed-cut combination, together with the extent of the accompanying cutting troubles (chatter, tool breakage, excessive tool wear, and many others), directly and accurately measures the overall effectiveness of the planning and execution of the entire attack on the problem of getting the most out of the cutting tool.

Premature dulling of the tool can result from improper grinding; improper tool set up; improper speed-feed-cut combination; improper choice and or application of cutting fluid; and other causes.

Select the proper combination from up-to-date sources—and then make the machine pull its weight. Use the horsepower available to you. It's there to make chips.

New metal powder developments under way

Several new powder metallurgy techniques are under development, according to papers presented at the 15th Annual Meeting of the Metal Powder Industries Federation, Detroit, April 20-21. One such development, "continuous compacting," was described by F Emley and C Diebel of Westinghouse's Materials Engineering Dept, East Pittsburgh, Pa.

The new technique is said to overcome size limitations now experienced in pressing individual structural parts. And it is capable of producing bars of unlimited length, large cross-sectional area, and thicknesses as great as desired or as little as 0.005 to 0.010 in.

Any briquetting press can be used for the process if powder is continuously poured into a three-sided metal trough. Compression is achieved with a punch that has steps parallel to the direction of powder flow. In this way, progressive compacting occurs as the powder moves across the punch face.

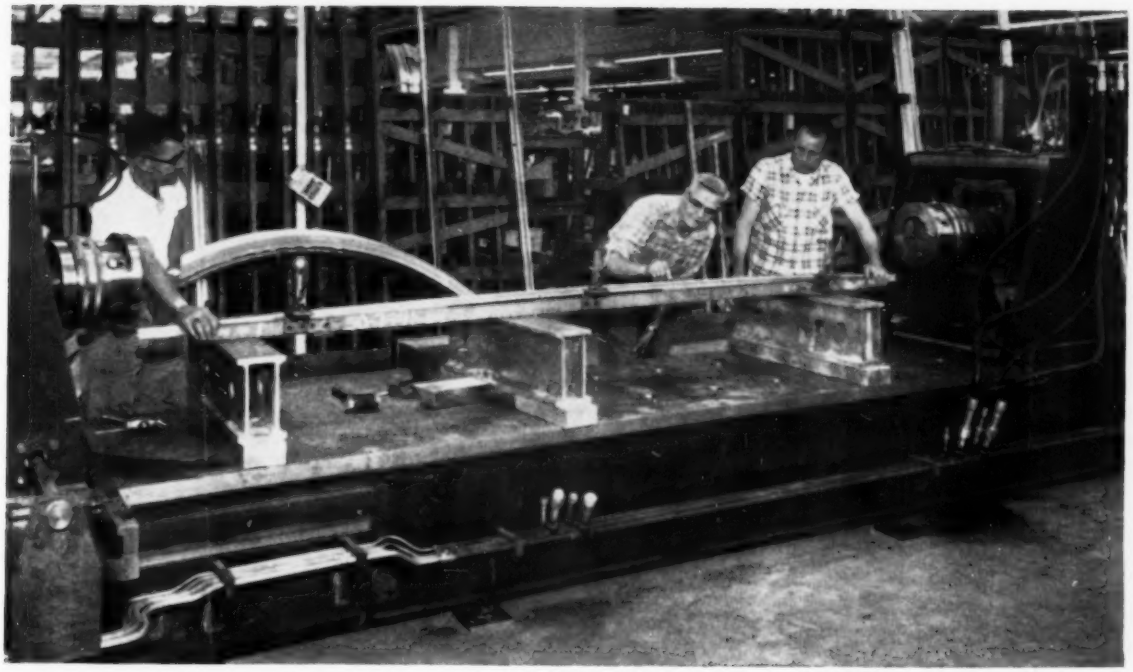
A starting block holds the powder in place until pressing is under way, after which the punch enters the trough to create an infinite number of compression and compaction levels. As the partly compressed powder travel across the face of the punch, compacting finally reaches the desired level.

Experimental work with micromesh sieves for particle size analysis was described by Metals Disintegrating Co's John Haertlein. Higher precision and accuracy, he said is achieved in measuring particle size distribution by extending sieve ranges from the usual 325 mesh (44 micorns) to sieves as fine as 20 microns.

Another new measurement idea was described by Dr Bennett Bovarnick, chief, Sintered Metals and Ceramics Branch, Watertown Arsenal. This method of 100% nondestructive inspection is based on the principle that surface energy of an object is dependent upon its electrochemical potential. A high statistical correlation exists between the potential as a measure of the extent of sintering and the strength that is obtained.

Other meeting papers included one on the increasing use of metal powder parts in the automotive industry by Roy Blue, Amplex Division, Chrysler Corp.

R L Ziegfield of Lead Industries Association talked on new applications of lead powder, pointing out that lead powder is now being used advantageously with metallic and non-metallic materials—to take advantage of its superconductivity, corrosion resistance, ability to stop x-rays and gamma rays.



Home-built straightener and stretcher . . .
produces shallow compound curves in parts up to 30 ft long to correct heat-treat distortion. Hydraulic pressure is applied laterally, vertically, or both. Main hydraulic cylinder rotates gimbals to raise, lower, or swing the part from side to side

Adapt, Improve, Refurbish are bywords when...

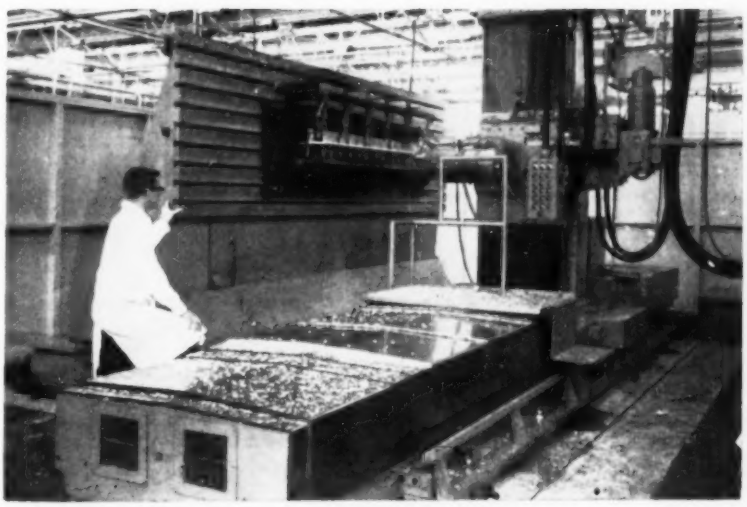
Aircraft subcontractor goes into airframes

By George H DeGroat,
associate editor

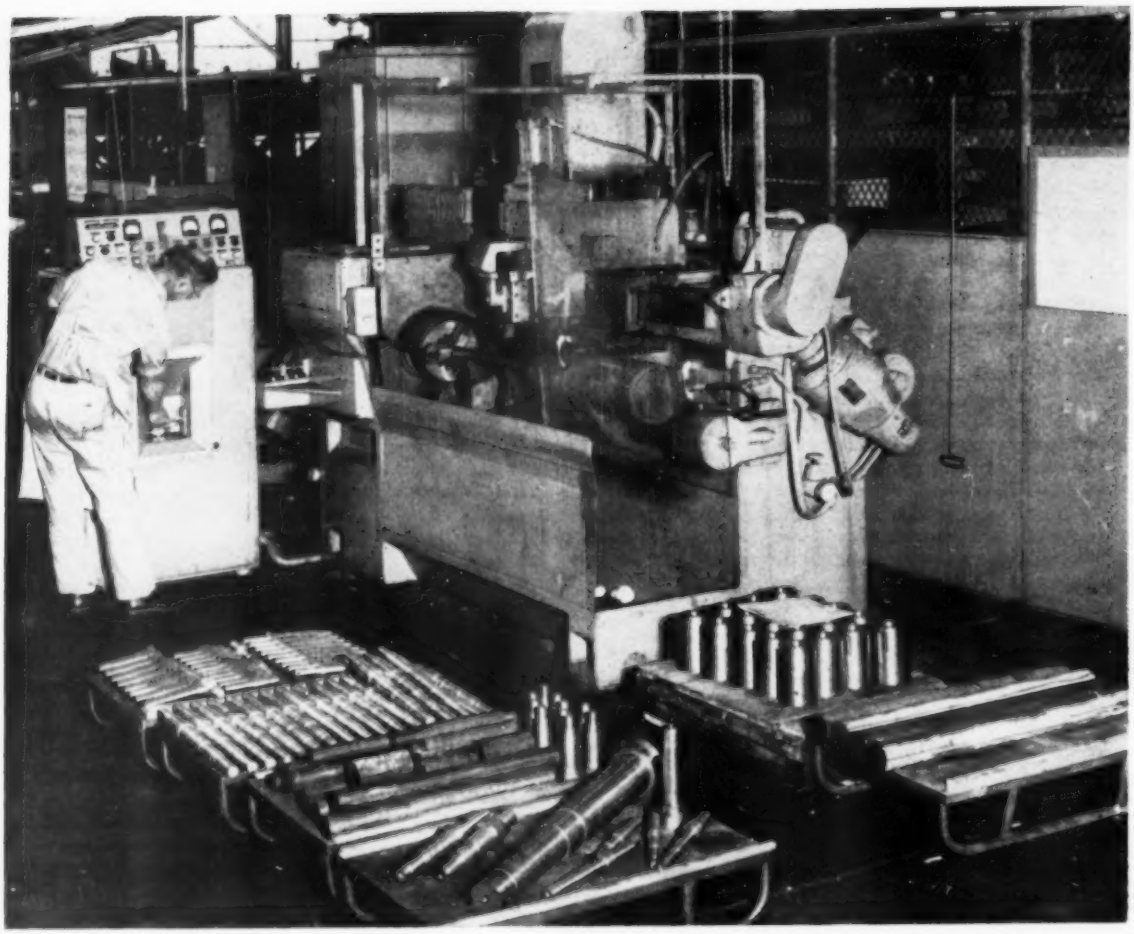
Rohr Aircraft did some imaginative machine rebuilding when the Chula Vista fabricator started building structural aircraft members in addition to engine pods and engine assemblies. New equipment was added to handle larger sheet-metal and beam parts, and some new machines were designed and built in the plant.

Equipment that produces flap tracks, horizontal stabilizers, and elevators includes a 25,000-ton forming press and a 100-ton rotary forming machine fabricated at the plant. Another shop-designed machine is the illustrated stringer-straightener and stretch-former, which is served, with other machines, by a 2500-psi nitrogen-and-oil accumulator hydraulic system.

Accompanying illustrations show two special machines—one built in the shop, the other adapted for special work.



Modified tape-controlled miller . . .
cuts a wing chord (too large to be forged) for Boeing KC-135 jet tanker. Rohr programs a 1-in. paper tape in binary code, then central master director at Convair, San Diego, produces the commands on 1700-ft reels of magnetic tape, which operate the Giddings & Lewis vertical miller



Control console at left . . . operates 40-hp automatic lathe through one cycle for each punched card stacked in opening. Workloading and startup are not card-programmed, nor are auxiliary-slide operations

HERE IS HOW...

Numerical control chops spindle-turning time

By L P Armovich, factory manager, Machine Tool Div, Sundstrand Machine Tool Co, Rockford, Ill

Production experience with numerical control demonstrates that a card-programmed lathe can beat floor-to-floor time for a tracer lathe by 30-85%. This speed advantage has shown up on single parts and on lots of a hundred; but the most telling experience to date has been with stepped shafts in lot sizes around a dozen. Setups for programmed parts can be changed over in 5-15 minutes.

Tabulated data is from a Sundstrand model 14 lathe controlled by a GE punched-card discrete-positioning (point-to-point) console. Cards control these functions:

- Spindle speed, start, stop
- Rapid traverse and power feed to within 0.005 in. of length
- Rapid traverse for toolslide and power feed to within 0.0005 in. of required dia
- Select (but not operate) auxiliary slide for chamfer, neck, etc

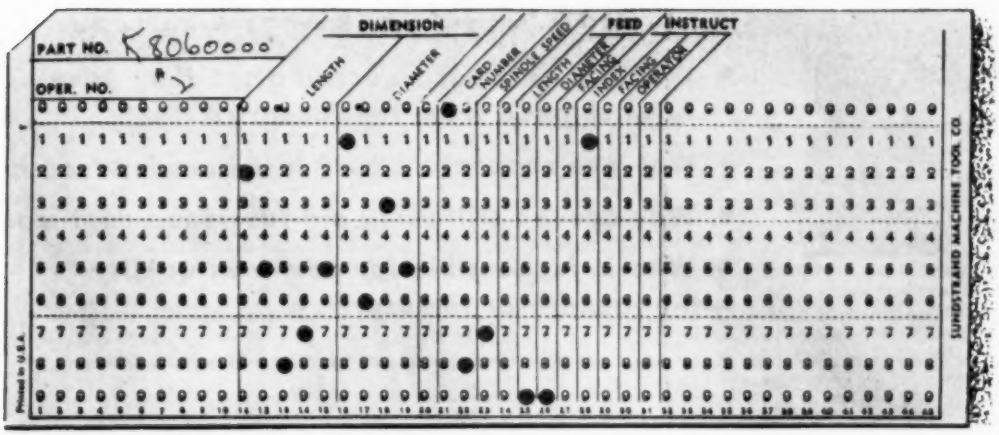
In addition to operating speed and fast work setup, preparation work before the setup is made has been speeded by 9:1. Sketches, calculations, and punched cards can be produced in around 5 hr for a typical job, where time to design, draw, and fabricate two templets for a tracer lathe has averaged 44 hr. This indicates that a card-controlled lathe might be economically applied for lot sizes only 1/9 of those suitable for a tracer lathe. In addition, card programs release skilled men from templet making to do other work.

A stack of cards is required for each job. Each card controls the machine through one pass or a change-

Reductions in Floor-to-Floor Time for Typical Stepped Shafts

Pc in Lot	Type of Steel (HR Bar)	Size of Bar Length (In.)	Size of Bar Dia (In.)	Time for Setups on Card-Controlled Lathe: First End Cut No. Dias Cut	First End Cut No. Cycles	First End Cut Time/Pc (Min)	Second End Cut No. Dias Cut	Second End Cut No. Cycles	Second End Cut Time/Pc (Min)	Total Time for Lot (Min)	Total Tracer Lathe Time for Lot (Min)	% Savings in Time
10	4140	12¼	4¼	4	2	1.66	5	2	2.02	57.80	250.00	77
				4	1	1.56	5	1	1.90	55.60	350.00	84
10	4615	13⅞	3	3	2	1.64	3	3	2.40	61.40	300.00	79
				3	1	1.70	3	1	1.85	56.50	180.00	68
12	4140	9 11/16	2⅜	3	2	1.81	3	2	1.62	62.16	360.00	83
				4	1	1.70	6	1	1.85	63.60	360.00	82
5	4140	9¾	2¼	4	2	1.53	4	3	2.15	39.40	135.00	71
				3	1	1.40	6	1	2.00	38.00	270.00	86
6	4615	23⅜	2¾	4	2	3.39	4	2	4.10	65.94	216.00	70
				3	1	2.66	6	1	3.05	55.26	198.00	72
12	C1045	16	5½	1	1	3.28	11	11	12.42	209.40	864.00	76
							8	1	3.30	51.60	420.00	88

These time savings . . .
show numerical-control advantage. First operation for each lot is roughing; second is finishing. Each shaft was chucked four times, except last, which had no finishing pass on first end. All first ends were set up in 12 min, second ends in 9 min

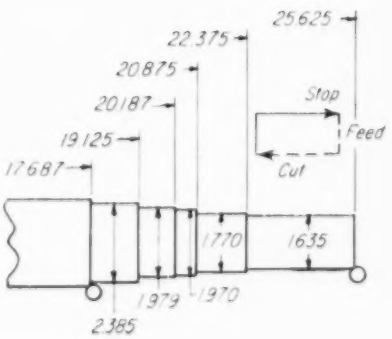


Card controls one tool cycle . . .
Read end diameter and end length (including clearance) on the card. This was eighth card in a stack of 14 for this setup. The 25.875 on the card includes extra end allowance beyond the required 25.625 in.

over function. Normal limit on depth of cut is 7/16 in.—1/16 in. for finishing—so a deeper cut must be made in several passes—and with several cards. Each card moves the toolslide a specified length down the axis of the work, which is measured from a zero point within the spindle nose. The same card controls diameter, which is actually a radial dimension from the axis of the work, but is noted on the card as a diameter measurement.

Data is set up in a table, where operation sequence and dimensions are specified; then the cards are punched to suit. Cards are numbered in order by punched marks to make the machine shut down if cards get scrambled. Any card can be replaced easily if adjustments are necessary.

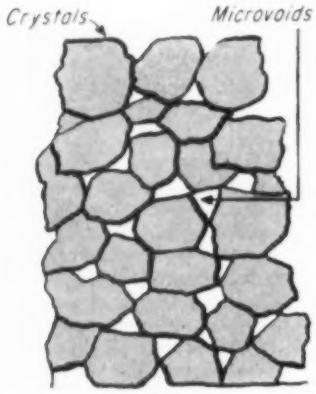
On these double-end shafts, some parts may require four operations if added cutting must be spaced between roughing and finishing setups; but in many cases only two work setups—one for each end—are necessary.



This is high quality cast iron . . . with fine, random-dispersed flake graphite, purely pearlitic matrix, and all phases clearly visible under 300X magnification. Hardness is 217 Bhn

This is cast iron . . . without a pedigree. Structure is spongy and soft (50X). Large black area is a void; black lines are coarse flake graphite. White areas are ferrite; shaded areas are pearlite

Completely chilled cast iron . . . looks like this under 100X. White areas are from carbides—no graphite is present. Black areas are pearlite



Microvoids in a test bar . . . determine strength. Voids have no strength, and if they are plentiful, the iron may be only 60%, 80%, or 90% etc of full strength. Voids may be missed under microscope, so several fractures must be checked

What is "HIGH-QUALITY"

By John Obrebski, chief metallurgist, Monarch Machine Tool Co, Sidney, Ohio

- ***Why are castings rejected after they have been shipped from the foundry?***
- ***Why are separately cast test bars inadequate?***
- ***Why are we still using old-fashioned cast iron?***
- ***Who is responsible for cast-iron quality —the foundry or the user?***

For answers to these questions—and reasons—read on . . .

There are only two kinds of cast irons:

1. High-quality cast iron
2. Cast iron

There are many grades of high-quality cast iron. To the user there is only one grade—the one he wants. But to the foundry this single grade may be many—all adjusted for section thickness to give the user the desired properties uniformly in all castings. The foundry must produce metallurgically different cast irons for different castings.

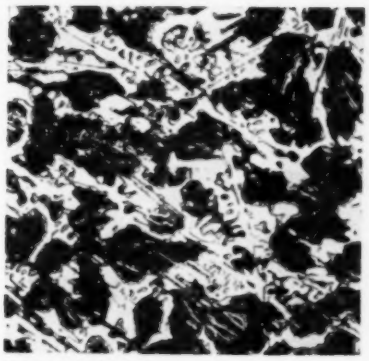
The search for stronger, lighter parts demands high-quality cast iron for most applications, and there is less and less room for poor cast iron. If cast iron is to compete with aluminum, it must be further improved.

Cast iron is not the simple, well-known workhorse metal that many still believe. It is a complicated alloy with many considerations. Old-fashioned cast irons are still with us. Any foundry can produce them; many can produce nothing else. They are useful when high quality is not required and when an inexpensive product will do an adequate job. But high-quality cast irons for products that demand dimensional stability, strength, and machinability must be produced by enlightened smelting and ladle treatment.

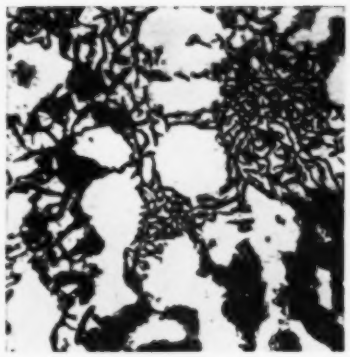
The label "high-quality' means that a cast iron has these characteristics:

- Metal matrix of pure pearlitic iron.
- Structure fine and close grained.
- Graphite fine and flaked, randomly dispersed.
- With reasonable section differences, mechanical properties fairly uniform.
- Machinability fair.

Old-fashioned cast irons are unreliable. Usually they are high-carbon, high-silicon irons. The graphite is coarse and unevenly dispersed, and the castings are often spongy, porous, and therefore weak. An old-fashioned cast iron with the proper chemical analysis for strength and toughness has a strong tendency to chill (solidify as white iron) at the corners and in thin sections. This chill is usually undesirable because it makes machining almost impossible.

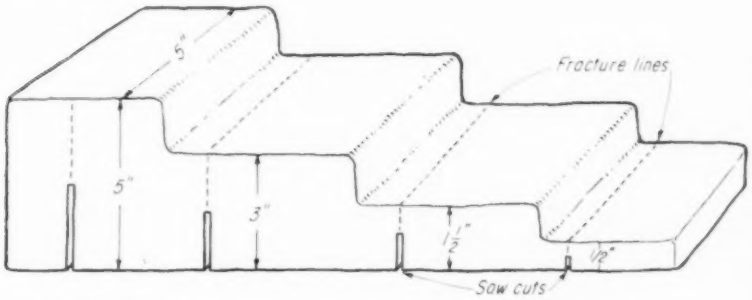


High quality CI . . .
as sand cast without inoculation. White areas are primary carbides, which indicate partial chill. Gray areas are pearlite. Hardness is 160 Bhn. (200X)



Cast iron . . .
with harmful eutectic graphite (the spidery black lines). White areas are ferrite. Hardness is 150 Bhn. (150X)

cast iron?



Special test bar . . .
can be cast, then sawed so fractures through various sections can be made. This provides a true picture of the sensitivity of the cast iron to chill depending on the solidification rate

Smelting

High-quality cast iron must start at the cupola, where careful charging and control can produce a better metal. A poor cast iron cannot be effectively improved by ladle additions; it must start as high-quality cast iron. The raw materials—coke, scrap iron, pig iron, scrap steel, and limestone—must be chosen cautiously and properly proportioned to produce the required chemical composition and metallurgical quality for the conditions under which the casting will be applied.

The first problem is carbon. It takes two forms in cast iron—graphite flakes and iron carbide, or cementite (combined carbon).

Carbon comes from several sources, the obvious one coke, which is 98% carbon. Scrap iron (about 3% carbon) adds some, and pig iron may add much more. One way to reduce total carbon in the casting is to add scrap steel (about 0.2% carbon) to the cupola.

The graphite flakes in pig iron are coarse and if they are undissolved before pouring, they become nuclei for growing coarse graphite flakes in the casting. They may be dissolved by running the cupola hotter by adding a larger percentage of steel. Using more steel, of course, also reduces the percentage of pig iron.

Other additions are made to control chemical analysis. Manganese can be added by using high-manganese pig iron or by adding ferro-manganese. Silicon is controlled with ferro-silicon. Minerals that produce special slags are added to take out sulphur and phosphorous.

Control of the furnace is important, too. Fast melting and high temperatures, possible in modern furnaces, also help dissolve graphite. However, high melting temperatures must not result in high pouring temperatures, which would cause casting difficulties. Furnace operation must strike a balance between chemical composition required and temperature treatment achieved by forced-air-supply control for volume, temperature, pressure, and humidity.

The aim is to keep carbon and silicon contents low and to raise the manganese/silicon ratio. This results in high strength and elasticity in the cast iron. However, if the melt is controlled to produce these desirable properties, the cast iron may chill in thin sections that solidify more rapidly. This tendency to chill can be controlled by inoculation at the spout. In fact, the cast iron is aimed for slight chill, then is forced into gray solidification by inoculation.

Inoculation

Chill can be prevented by adding alloying elements such as nickel and copper, but these are expensive and often not at all necessary if inoculation is used. Inoculation makes use of "graphitizers"—chemical additions that prevent the formation of primary iron carbides. They allow the foundry to further refine the melt with lower carbon, lower silicon, and higher manganese/silicon ratio without danger from chilling.

Inoculants like silicon-calcium or silicon-titanium-calcium will force the metal to solidify as gray iron. Inoculation will force a ¾ or 1-in. section of iron with 2.9% C, 1.3% Si, and 1% Mn into gray solidification, even though the same section would have to contain 3.2% C, 1.7% Si, and 0.9% Mn to produce gray iron normally.

Thus, inoculation makes it possible to produce fine and close grained gray iron in all sections of the casting, even though the chemical composition of the cupola charge would normally produce gray iron in heavy sections and chill in thin.

There are limits to inoculation, of course. Fairly uniform mechanical properties can be attained with inoculation if sections vary in thickness no more than about 3:1, but drastic differences in section may cause trouble in spite of inoculation.

A foundry that practices inocula-

tion can do as much—in the way of custom-blending cast iron for different applications—with three to six grades of iron as a foundry without inoculation can do with five to eight.

One of the important factors in cast iron is the ratio of manganese to silicon. Too low a ratio may result in ferritic structure of the matrix; too high a ratio may result in chilling. This ratio is more important than the percentage of either manganese or silicon alone. For example:

1. Non-controlled cast iron, 3.28% C, 0.84% Mn, 1.25% Si, 0.16% Cr; Sections ¾ in. and thinner partly or completely chilled.

2. Non-controlled cast iron, 3.38% C, 0.99% Mn, 1.69% Si, 0.2% Cr: All sections up to ¾ in. gray—no chill.

3. Controlled cast iron, 3.30% C, 0.82% Mn, 1.04% Si, 0.10% Cr: All sections up to ¾ in. gray.

4. Controlled cast iron, 3.30% C, 0.83 % Mn, 1.15% Si, 0.10% Cr: All sections up to ¾ in. gray.

Note that silicon content was low for the two controlled irons, yet inoculation kept them gray. In the first case, even as much as 1.25% silicon could not prevent chilling. And note that the Mn/Si ratio for case 2 was 0.585, while case 3 had 0.79—and the iron was gray.

Tests guide control

In spite of close control of the charge and the cupola, the resulting iron may not be sufficiently accurate to produce completely desirable castings. But final adjustments can be made by inoculation. A test wedge is poured from the iron before inoculation, then fractured to check the amount of chill. Then the iron is inoculated.

The test wedge—also called a "constitutional" wedge—tapers in section thickness to show just where chilling starts. The same kind of wedge can be cast after the ladle load is inoculated to check on results; rechecks can be made if more inoculation is required.

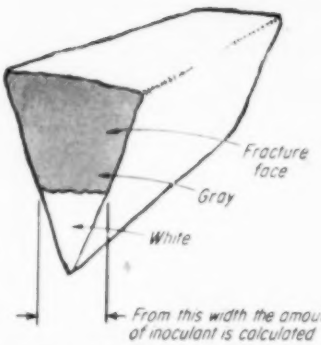
Although tensile tests are conventionally made on separately cast bars, these bars are unreliable as guides for evaluation of the castings themselves. A separate bar with standard cross-section cannot cool at the same rate as a casting, and it may therefore have internal structure quite different, even if the chemical analysis is identical. The casting may have sections that vary from ½ to 4 in. thick, and it may have a non-uniform shape. The test bar in no way approximates the actual casting, physically.

It may be possible to cast a sample part, then machine out test bars from various sections. These test bars should be quite similar to the castings to be poured later.

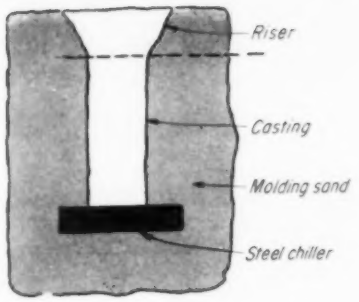
Cast iron always includes microvoids, graphite particles, and the matrix, or metal grains. These voids may only be a small percentage of the cross-section of the casting, but they very much influence mechanical properties. They may be missed due to polishing when the specimens are examined through a microscope. For this reason, it is always best to examine fractures with a binocular microscope.

The matrix supplies all the strength of the casting; voids have no strength, and neither do particles of graphite. And the matrix also supplies all the hardness. The matrix may be made up of ferrite (90-100 Bhn) or pearlite (230-340 Bhn) or both. To cover an area large enough to average out the matrix, voids, and graphite, the hardness test should be made with a sufficiently large ball penetrator, such as Brinell.

This applies a 10-mm ball with a load of 3000 kg, and produces an impression with a diameter of 4.35 mm for 192 Bhn. Both Rockwell and



Constitutional wedge . . . is cast before inoculation to detect natural chill. Amount of inoculating materials can be calculated from depth of chill—or by measuring width at edge of chilled area



Intentional chilling . . . can be forced with a steel chill bar inserted in the sand mold. This is another kind of constitutional wedge which measures the sensitivity of the iron to chill

Safe Chemical Compositions for Controlled Cast Iron

% Steel in Cupola Charge	C Total	Si	Mn	S Max	P Max	For Sections
80	2.90-3.10	1.20-1.30	0.75-0.85	0.12	0.15	1 in.
70	2.90-3.10	1.20-1.30	0.75-0.85	0.12	0.15	7/8 in.
60	3.10-3.20	1.35-1.50	0.75-0.85	0.13	0.15	3/4 in.
50	3.10-3.20	1.35-1.50	0.75-0.85	0.13	0.15	5/8 in.
40	3.20-3.30	1.50-1.65	0.70-0.80	0.15	0.17	5/8 in.
30	3.20-3.30	1.55-1.70	0.70-0.80	0.15	0.17	1/2 in.
25	3.30-3.40	1.70-1.85	0.65-0.75	0.15	0.25	1/2 in.
15	3.30-3.40	1.85-2.00	0.65-0.75	0.15	0.25	1/4 in.
10	3.40-3.55	2.00-2.15	0.60-0.70	0.15	0.25	3/16 in.
0	3.40-3.55	2.20-2.30	0.55-0.65	0.15	0.25	1/8 in.

The Mn/Si ratio and steel addition change as the section changes; it may be 0.267 for ⅛-in. sections, and may climb to 0.80 for thick sections.

Influence of Alloying Elements in Cast Iron

Casting No.	C	Mn	Si	Mo	Cr	Ni	Condition
1	2.9	0.95	1.34	0.31	0.39	trace	chilled
2	3.2	0.93	1.45	0.55	0.42	0.87	machinable
3	3.33	0.83	1.61	0.58	0.41	trace	"
4	3.35	0.87	1.63	0.48	0.39	1.20	"
5	3.19	0.86	1.60	0.52	0.36	trace	"
6	3.38	0.93	1.44	0.37	0.36	0.88	"

Test log . . .
is cast as an integral part of the production casting. Log and casting will be numbered for identification, then log fractured and tested to check on quality. Data is filed for reference

Scleroscope penetrators are small, and they tend to produce many different readings in a given small area of a casting section. The small penetrators can be applied to flame-hardened cases, though calibrated files are a good method of testing case hardness.

Conversion tables between these hardness tests have been worked out for steel (none too accurately), but they do not exist for cast iron.

The most positive answer to the evaluation of an experimental casting is to cut up a casting into pieces and test many locations—core, edge, and in between. This test will show that there is no such thing as a single hardness value for a casting; there are many hardnesses in many sections of each casting.

Alloy cast iron

Plain cast irons can be made into high-quality cast irons if metallurgical processes and chemical compositions are controlled. Starting with a quality grade of iron, a special grade can be made by alloying; but alloying will not produce usable results in a poor iron.

Alloys are added to improve selected physical properties; each requirement demands a different alloy, and each alloy produces a different result. If too many alloys are added, they may tend to counteract each other and produce nothing new—and the only result is an increase in cost.

Best practice is always to try to squeeze the most desirable physical properties out of the cast iron with perfected metallurgy. If alloys are absolutely required, start with small quantities and increase gradually. Some alloying elements increase hardness, and if the iron is to be machined, this should not go above 220-230 Bhn. But if higher hardness is required, it can be attained by lowering carbon and silicon contents without resorting to alloys.

Nickel has been alloyed in cast iron for years, but wartime shortages showed that nickel additions were not needed in many cases. Molybdenum in quantities of 0.15-0.20% will increase tensile strength and hardenability, and it stabilizes the pearlitic matrix.

Chromium is less effective alone, and must be added in quantities of 0.30-0.50% for the same results. Chromium and molybdenum add hardness and wear resistance.

Nickel is a graphitizer, and it works in the same direction as silicon. Therefore, if nickel is added, silicon must be reduced. Nickel counterbalances chromium and molybdenum, therefore may be useful where thin sections are involved.

To demonstrate the influence of alloying elements in cast iron, identical heavy castings with maximum sections of 2 x 3 in. were examined (see lower table, p 106).

Casting No. 1, with low carbon, low silicon, and high manganese, chilled because of the additions of molybdenum and chromium. Castings No. 3 and 5, also nickel-free, did not chill because carbon and silicon were higher. Castings 2 and 4 were also gray and machinable because of high carbon and silicon, but they included nickel that did nothing but raise the cost. In each of these examples, no alloying elements except 0.2-0.4% chromium were needed at all.

Nickel is a valuable alloy when the casting has thin walls and sharp differnces in section thickness. Excessive silicon here would result in coarse graphite, so nickel is added in place of some of the silicon as a graphitizer.

If cost is not an important factor, some higher mechanical properties can be attained by adding nickel (1.5-2.0%) to low-carbon (2.5-2.7%), low-silicon (1.0-1.2%), high-manganese (0.9-1.0%) cast iron. Special grades of cast iron such as "Nihard" and "Niresist" contain a lot of alloys, and are usually selected for special applications.

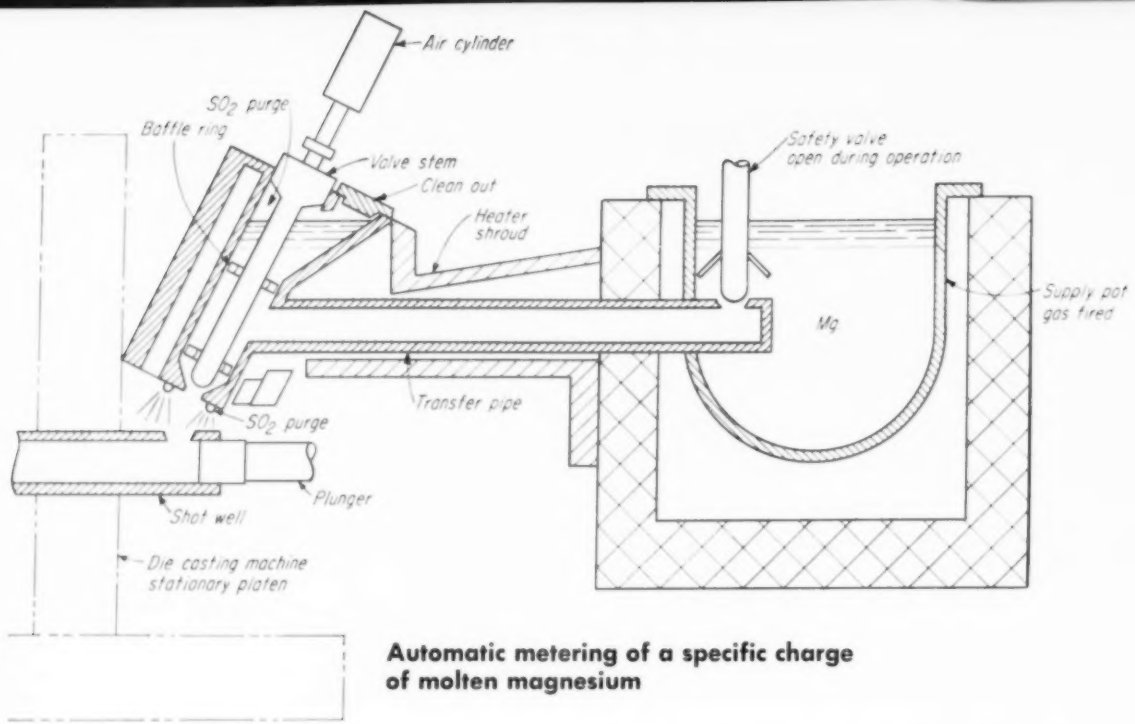
Chromium, vanadium, and molybdenum are added in small amounts to improve the metallic matrix—and to slow down the graphitizing effect. Chromium should be applied in quantities of 0.2-0.5%, vanadium 0.05-0.2%, and molybdenum 0.2-0.3%.

Heat treat procedures

Stability of pearlite is most important if the cast iron must be furnace heat treated, flame hardened, or induction hardened. In one test four cast irons, all with hardness of 200 Bhn, were heated identically to 1550 F in a small laboratory furnace. After slow cooling, their hardness ranged from 200 to 140 Bhn—indicating that some were less stable than others. Chromium (0.2-0.4%) and molybdenum (0.2-0.3%) improve stability. Of course, if the hardness as cast is only 140 Bhn, the iron is basically wrong for heat treating, and no alloying will help enough.

Theoretically a thick-wall casting can be improved by adding nickel to allow through heat treating; but through heat treating is not often justified or necessary. And alloys that improve strength in the matrix of the iron will not improve the strength of the casting if the graphite is coarse and voids are within the casting.

Heat treatment will increase wear resistance in stamping dies, for example; induction or flame hardening will increase hardness on the exterior of the casting. But for skin hardening, no alloying or only slight alloying is required. If heat resistance, corrosion resistance, and unusual hardness in the as-cast condition are demanded, large amounts of alloying elements are required.



Automatic metering of a specific charge of molten magnesium

Each of the shots is made with a special device at each casting machine. The metal flows by gravity through the normally open safety valve and transfer pipe to the valve, where it rises to the same level as the metal in the supply pot. Actuation of the air cylinder causes the charge to be injected into the shot well. Then the valve stem engages the seat, causing the flow to close off. A baffle on the stem operates freely in the valve casing, restricting a lowering and surging of magnesium from the valve standpipe when the valve stem is first opened

Switch to Mag triples die-casting

It takes just about one-third as long now to die-cast parts for small electric motors at Westinghouse's Small Motor Division, Bellefontaine, Ohio. Production costs have come down drastically, too.

The reason lies not so much in the method, although that enters into it, but in the material—Westinghouse has switched from aluminum to magnesium — and magnesium die-casts three times as fast as aluminum because of its lower specific heat and lower fusion point.

Die life in magnesium casting is about equal to that obtained with aluminum, but die lubrication is easier and the die temperature is almost constant during operation because of the speed of the process. And this, of course, minimizes thermal fatigue.

Too, magnesium's machinability is about three times that of aluminum so that machining rates are not only much faster, tool wear is reduced considerably.

Another (less tangible) saving is gained by a reduction in storage space needs. That's because magnesium does not change its dimensions with age, while aluminum does to some extent. For this reason, Westinghouse finds it's no longer necessary to store a two weeks' supply of castings as a hedge against post-machining dimensional changes.

Teamed up with a new automatic ladling setup, the magnesium process gains so much production over aluminum methods that it equals the output of three additional die-casting machines and three aluminum melting furnaces. On top of all this, it costs less to ship motors made lighter through use of magnesium parts and brackets.

Westinghouse-Bellefontaine combines automatic ladling with the cold chamber die-casting process, which costs less to maintain and is more adaptable than the hot chamber (goose neck) process that is employed in some high-volume magnesium die-casting setups.

To be more specific: moving parts in the charging chamber of the hot chamber process, such as pistons and cylinders, require frequent replacement because of rapid wear at temperatures around 1200 F.

With the cold chamber process, replacement of parts is less frequent, costs less. For example, a valve stem and Stellite-coated seat for the cold chamber cost about $100, compared with $1500 for the plunger mechanism for a hot chamber setup. And this doesn't include the cost of downtime during replacement (infinitely greater for the hot chamber).

Two 500-ton Cast-Master model 20A toggle-type machines produce approximately 300,000 brackets per month in this plant. Two double-cavity dies, once used for casting aluminum brackets, are available for each style of bracket. This provides enough tooling to maintain a constant flow of production when a die requires repair.

Manufacturing flow starts with manual charging of magnesium pigs into a 1700 lb breakdown furnace located behind a protective firewall. After a refining period, the breakdown furnace is tilted to direct the

Switch from Al to Mg . . .
. . . in die-casting these motor brackets involved only minor redesign. Main idea was to keep the cross-sections uniform, so that segregations wouldn't occur where thick and thin sections adjoined. Close control over casting temperatures insures uniform shrinkage, holds tolerances. About eight different brackets for small motors are made this way

By Hassel DePree
Supervisor manufacturing engineering
Industrial Motors Dept
Small Motor Division
Westinghouse Electric Corp
Lima, Ohio

Elevator and hopper . . .
. . . charge preheated (to 450 F) heavy magnesium scrap into a 1700-lb breakdown furnace. Magnesium dumpings are charged in, too. Molten metal is delivered at a rate of about 700 lb per hour from this furnace when two die-casting machines are running

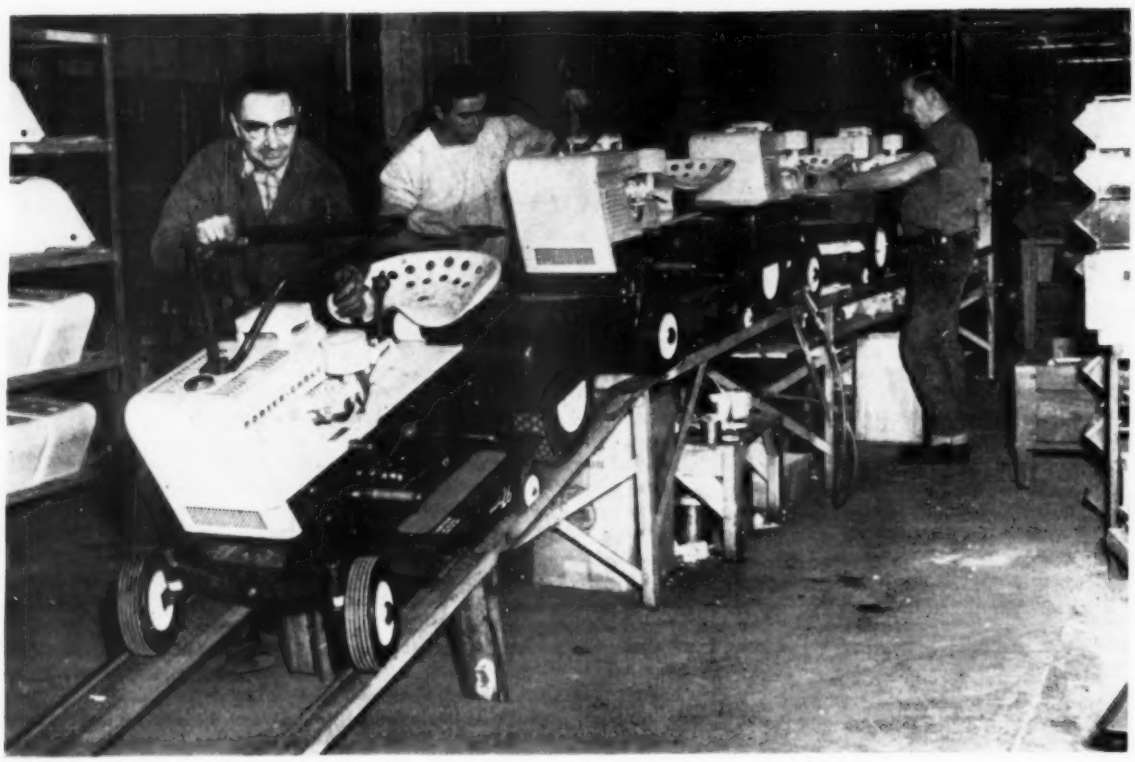
speed

flow of molten metal through heated troughs into two 1000-lb holding furnaces, and then directly to the casting machines.

At each machine, the molten metal is automatically metered and fed into the closed die when the operator presses a button. This "die close" button causes (1) lubricant to be automatically discharged into the machine's shot well, (2) the die to close completely, (3) the automatic metering valve to open and close, (4) the plunger to inject magnesium into the die cavities, (5) a dwell for the casting to cool, (6) the die to open, and (7) automatic ejection of the castings. Special metering device includes a distributor ring at the valve outlet through which sulfur dioxide gas flows continuously to prevent oxidation of the metal.

Cycle time for most parts runs about three or four shots per minute. After a cluster of two brackets is removed from the die, the operator breaks off the gates and places them in a basket for transfer to the trim presses. **END**

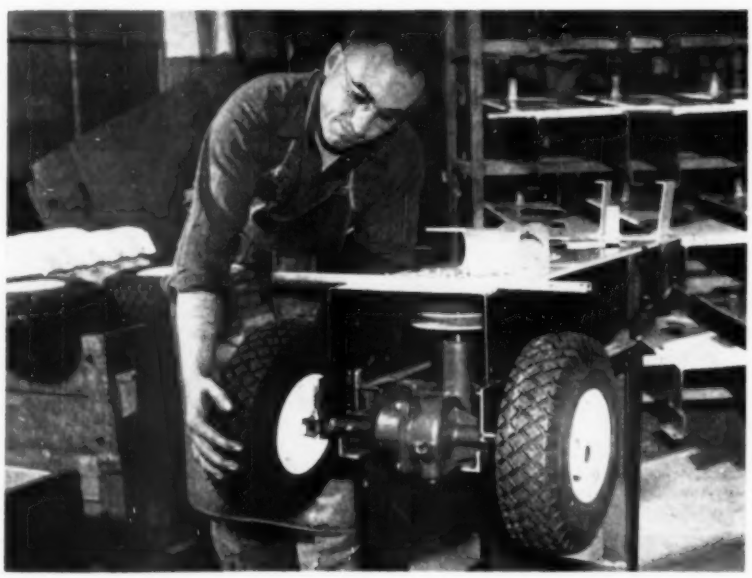
Die-casting of motor brackets . . .
. . . is done two at a time every 15 seconds. With average good practice, two-cavity dies produce about 150,000 pieces before reworking is necessary. Faces are cleaned about once a day with muriatic acid and an inhibitor to remove magnesium oxide film. This chemical cleaning is considerably simpler than the frequent die polishing needed for die-cast aluminum



Final assembly . . .
includes housing, handlebar, cutter unit, and seat. Cutters are both rotary and reel types

Line assembly turns out mowers

Detroit assembly methods also work in Syracuse, N Y, where Porter-Cable Machine Co puts together Yard Master riding lawn mowers. Line production proved most efficient for this small "car," which is built up, tested, and finally driven off the end of the conveyor. Most significant difference is that the mowers are lifted onto pallets, then box cartons are added and steel-banded for shipment.

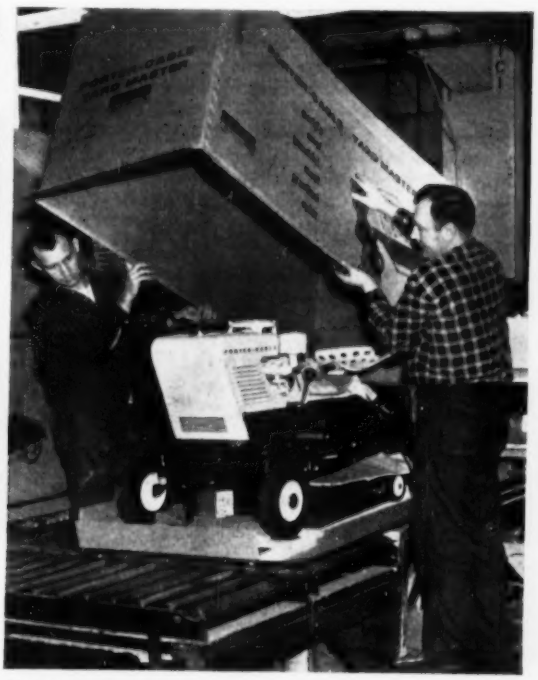


Wheels and differential . . .
go onto rear end of spray-painted frame, brought from booth by mobile racks

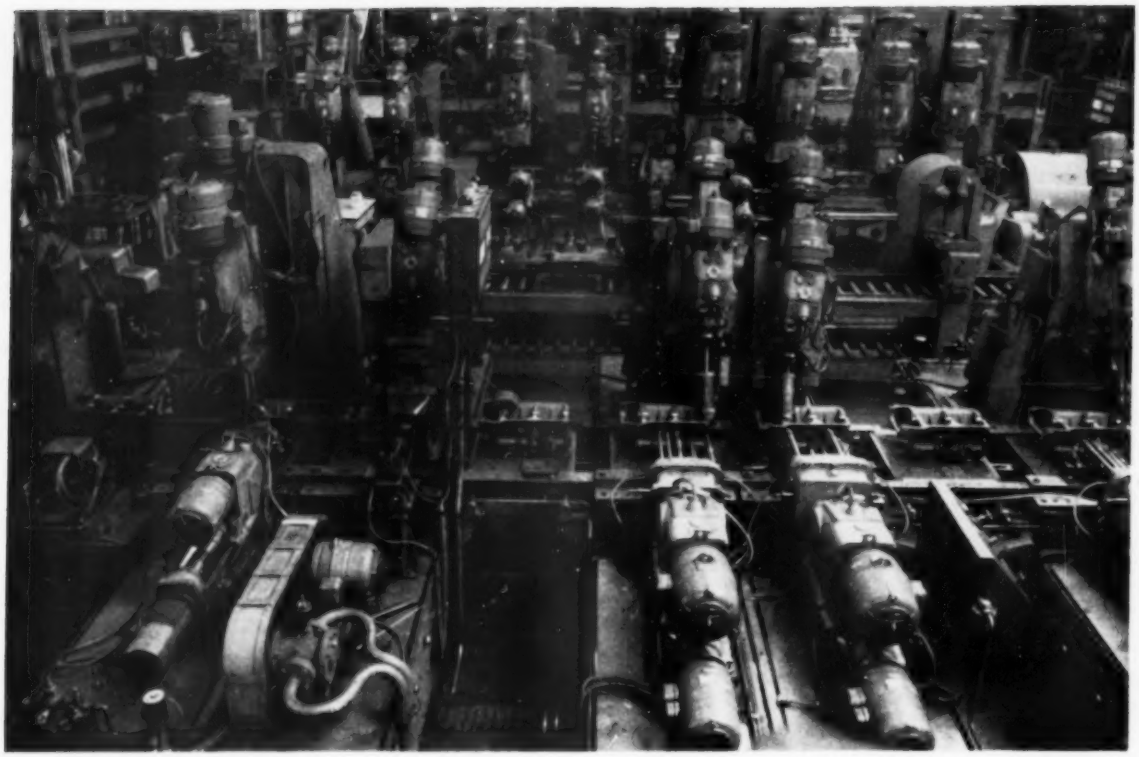
Engine . . .
mounts up front bolted to frame, then muffler and drive belts are added

Front wheels . . .
go on with steering assembly and gas tank. Tilt fixture and extra wheels simplify underside belt adjustments

100% inspection . . .
covers engine runup and rpm check with a strobe. Controls are adjusted here



Hoist places mower . . .
on pallet, where box carton is added and steel-banded. Next stop: somebody's yard



Renault-built transfer machines . . .
are all standardized on three basic sizes of electromechanical heads. This is a section of the cylinder block line, which performs 725 operations and turns out one piece every 30 seconds

At France's Renault

People at Renault never tire of reminding visitors that a Ford vice-president once described their factories as more highly automated than any in America. They also tell you proudly that every week their plants use enough steel to build an Eiffel Tower, enough glass to bottle the water of the Seine, and enough packaging material to wrap up the city of Paris. These claims are backed up by achievements in high-volume low-cost production that are truly outstanding.

Régie Renault now ranks as the largest auto manufacturer in France, third in Europe (after Volkswagen and BMC) and sixth in the world. Overall production rose no less than 28% last year, to more than 430,000 vehicles and tractors.

Current daily output is 1550 Dauphines (1400 at Flins and 150 at Billancourt), 120 trucks and 100 farm tractors.

Production costs have been progressively reduced to what is understood to be a phenomenally low figure. Renault's formula for success? "Put all your eggs in one basket—but make sure it's a damn good basket." That's the way Pierre Bezier, manager of the Machine Tool Department, puts it. Having established the Dauphine as their chosen basket, Renault engineers proceeded to make it as economically as possible, from the standpoint of both design and execution.

Forming vs cutting

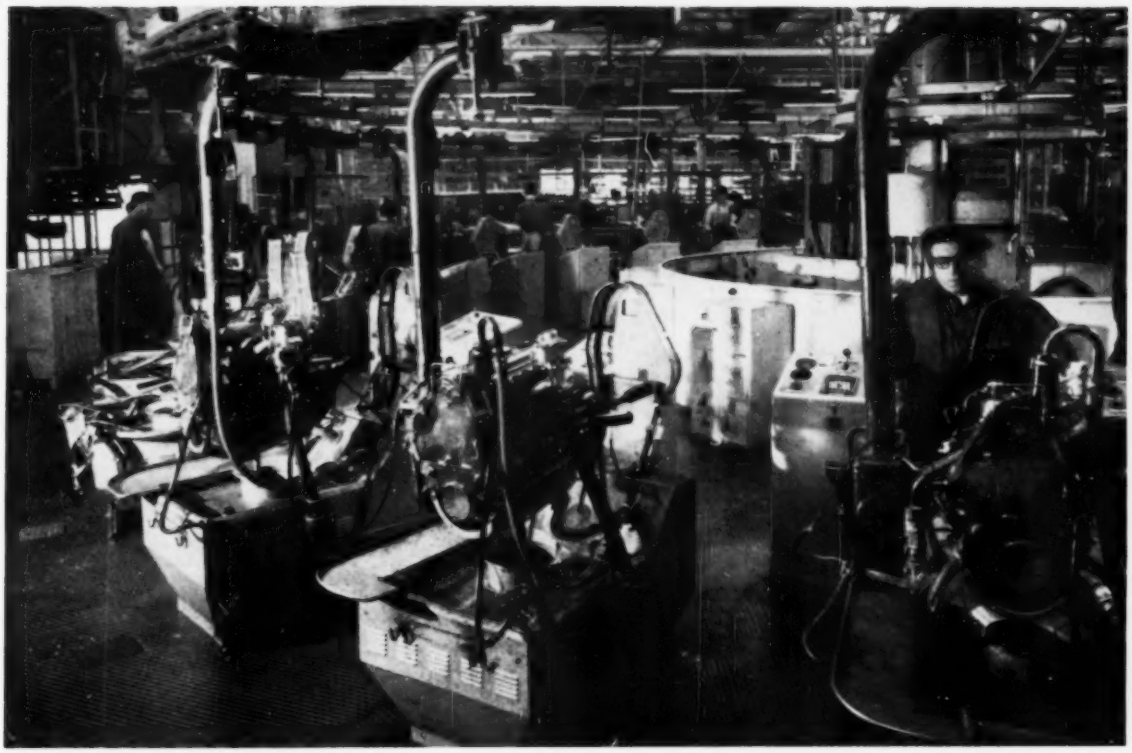
Metal forming rather than cutting whenever feasible is one of the starting points. Thus die casting is used for the water and oil pump bodies, extending the practice common for carburetors and fuel pumps in order to minimize foundry operations and subsequent machining. Aluminum cylinder heads, too, are die castings, although these are made with sand cores.

A compromise was struck on the cylinder block, which has wet liners. Basic production cost of this engine is higher than for one with integral bores (although the difference is less than $1), despite savings effected by a much simpler block casting and by using softer iron that is easier to machine and gives longer tool life.

The extensive transfer lines and automated machining at Billancourt, are steadily being elaborated and developed, and now Renault is moving ahead to automatic assembly lines. A great deal of this equipment is made in the factory's own shops.

Aside from standardization of unit heads and tables, which has been carried to great lengths, a fundamental consideration is strength. Idea is to build machines with plenty of reserve capacity. In the last year, output of many machines has been doubled and in some cases tripled simply by increasing speeds and feeds.

Renault strongly favors pneumatic rather than hydraulic operation, with mechanical as a second choice. Air is



Merry-go-round engine test rig . . .
has 26 beds spaced along the circumference of a large turntable. Engines come in on pendant fixtures, are switched to an overlying circular monorail, then hooked to beds which tow them around

it's "vive l'automation"

used whenever fine speed control is not important, while electro-mechanical drive is employed for slow steady feeds on such machines as grinders and fine borers.

Up to 700 people are engaged in machine tool production, and this side of the business has become so important in the fortunes of Renault that an autonomous division has been created. Concentrating on transfer and special-purpose machines, Renault has expanded its capacity to become France's sixth largest machine tool manufacturer.

A walk through one of the tool rooms at Billancourt reveals a wide range of equipment in various stages of completion. Here are jigs for components of standard unit heads, which are made in three basic sizes. The assembly line for these units includes several drum-type millers (including a four-spindle one for rough and fine machining both ends of universal joint spiders and yokes), and a transfer line for connecting-rods under construction for Peugeot, one of Renault's competitors.

Now nearing completion is a 17-station automatic transfer line for assembling rack-and-pinion steering boxes. After initial loading of the housing, the major components (pinion, rack and centering spring) are added.

At subsequent stations the bearings, seals, washers, circlips and other minor parts are fed in from vibro-electric spiral elevators on both sides, then pressed or located in position. Finally the housing is packed with grease and the cover plate is attached. This machine is claimed to be more advanced than anything comparable in America.

Costs are the yardstick

Automation and labor-saving devices at Renault are carried to the economic limit, but not beyond, for the cost analysts are constantly pressed by the management to keep in mind the average wage rates of 65¢ an hour. Thus automatic spray equipment was at first installed in the new paint booths at Flins, but this was found to be too expensive to operate, and now hand guns are used.

However, Renault's engineers do think that automatic assembly is economical in some applications, and one line of this type is already installed on the floor. It is a six-station unit that attaches the three main bearings to the cylinder block prior to fine boring. One operator does the work formerly requiring six men. The 23-ft line parallels a section of an old conveyor that accommodated (and remains in reserve for) manual assembly, is linked to it at both ends by short shunting lines.

Incoming blocks are moved sideways, pan face up, along the first shunting leg, where tapped and countersunk bolt holes are blown out by compressed air and bearing faces are brushed. Blocks are then engaged by the transfer arm of the

main line and advanced end-on to the first work station, where locating sleeves are pressed into the upper part of the bolt holes.

Hollow dowels are fed from a single vibrating hopper through six gravity chutes, with escapement mechanisms, to be positioned in three correctly-spaced pairs on the pre-load table on one side.

Shuttling pick-up head of the overhead press, actuated horizontally by an air cylinder and vertically by an hydraulic ram, drops down to grip the appropriate sets of sleeves in twin chucks. It then cross-indexes back and inserts them in the holes, after which it retracts.

High-level supply magazines

Common to all stations are supply magazines on a high-level deck over the line (which also carries the motors, pumps and compressors) and extensive use of pneumatics for indexing, part location, and work clamping.

Next comes an inspection station, where sleeve insertion is checked and threaded holes are oiled. Bearing caps are located at the third station, reaching the pre-load position via three inclined chutes. Here, pick-up and transfer operations are similar to those for dowels, although the travelling head is depressed by separate vertical cylinders for engaging and depositing the caps.

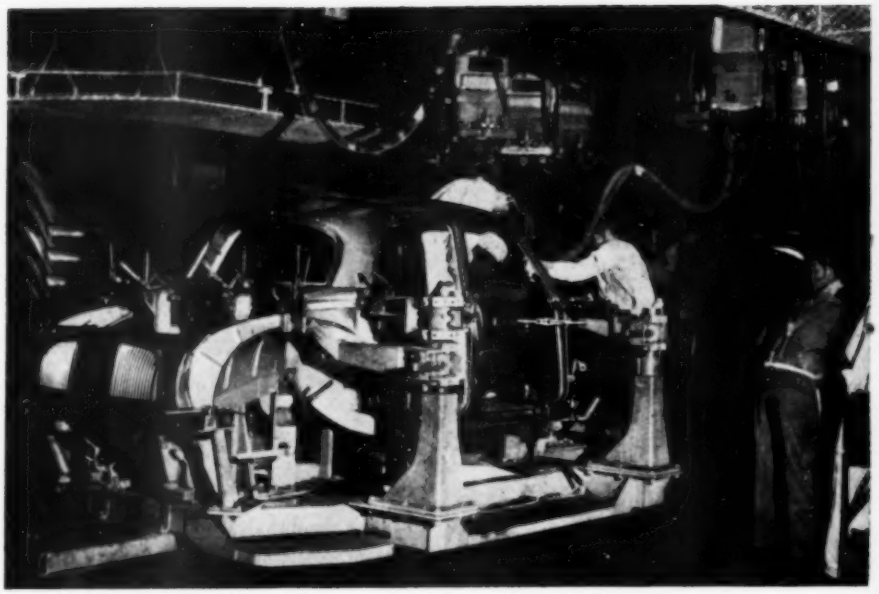
Carried on a horizontal slide lying across the line, and spring-loaded on vertical guides that permit small downward movement, the head traverses outwards over the three waiting caps. There it is pushed down by a pneumatic ram so that pairs of pendant internal chucks engage the cap drillings. Following an up-and-over movement, the head is then beneath a hydraulic cylinder which presses the caps onto sleeves in the block.

Bolts and washers are inserted at the next two stations, those for the front and rear caps at No. 4 and for the center one at No. 5. The complex sequence for component location by air-actuated transfer arms is the same in each case.

Washers are fed from above by chute so that their holes face the end of the bolt chute. As each bolt is released, it slides down a ramp and passes through a washer so that its threaded end projects into the line of travel of the first transfer arm.

A simple hand on an inclined pivoted arm picks the bolt and washer off the release device and carries them upward through a narrow arc to a vertical position approximately over the pan flange. There, a second arm with an overlapping hand receives the bolt and swings it through a horizontal plane to line it up with the cap hole below.

This arm then descends slightly to drop the end of the bolt in the hole, and then retracts horizontally to release the bolt. Finally, at the sixth station, the bolts are tightened by a six-spindle power wrench fed down by a pneumatic ram. Blocks are then shunted back to the through-line.



Heavy rail-mounted jig . . .
on the second leg of the body welding line is for addition of side panels, roof and rear grille. This section has six traveling jigs, and a seventh on the return rails under the floor

Automatic inspection

Setup for automatic inspection (after fine boring of crank and camshaft bearing holes) consists of a three-station transfer line, where the first two machines, each with mechanically fed twin-spindle horizontal heads, do roughing and finishing. A similar head at the third station is adapted for gaging.

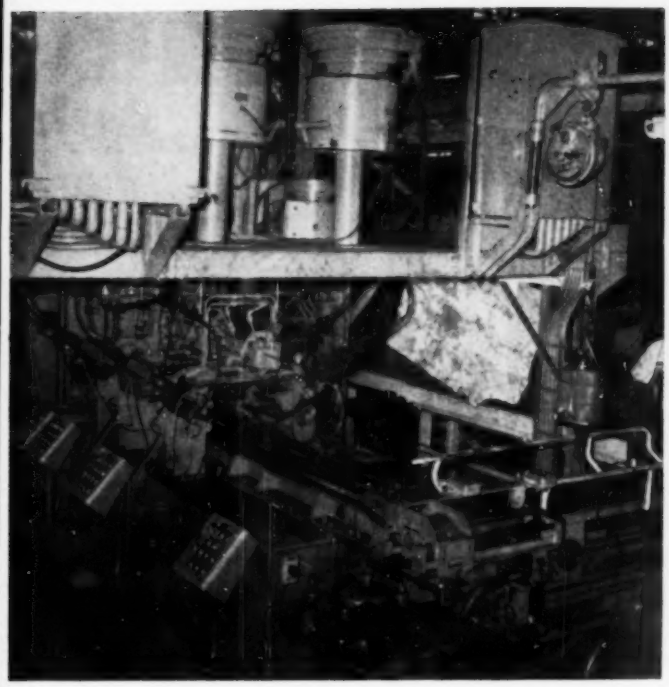
Air gages, spaced along the rotating spindles to correspond with the three bearings for each shaft, check both size and ovality when the head is fed in. Readings are indicated on individual circular dials for maximum clarity, and the machine stops when any tolerance is exceeded.

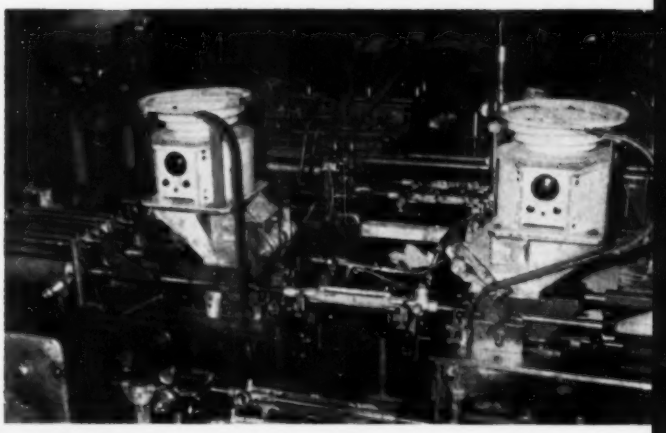
Renault has four such lines in parallel. These are fed through selective gate mechanisms on the main supply track, and at the start of each line a large transfer arm picks up a block moving lengthwise on its pan face and swings it vertically through 180° to place it crosswise on its head face on the boring line. A similar arm at the end inverts the block again as it deposits it on the common exit conveyor. The arm, however, is actuated only when there is a vacant space.

Last operation on the cylinder blocks is automatic washing on a Renault-built machine. This consists of three overlapping and enclosed drums for the sequence of washing in a hot soda solution, rinsing, and hot-air drying. The machine processes 14 blocks at one time (carrying 4, 6 and 4 respectively, in the drums), operates on a 25-second cycle.

At the start, the entrance door of the first drum slides open and a block is pushed along the incoming rails into an empty compartment. When the door closes, the cleaning spray starts and the drum slowly rotates forward, stopping every 90° for loading and transferring. At the second index, the block under observation has swung through a semicircle and is opposite the internal door communicating with the second drum. The door then opens and the block is pushed across into a waiting compartment.

The same transfer operation occurs after rinsing, when the block is





ABOVE: Partially completed machine . . .
at Billancourt comprises two stations of a 17-station transfer line for automatic assembly of rack-and-pinion steering units. Small parts, fed from vibrating hoppers, are positioned as work moves along

LEFT: 6-station assembly line . . .
attaches bearing caps to cylinder blocks before they are fine-bored. This is the machine's exit end. Supply hoppers and equipment are on upper deck. Old conveyor (for manual assembly) is in back

moved into the drying drum. Finished blocks emerge through an external exit door. At each stage the block travels through a 180°arc, exposing all sides during inversion. Drum speeds are synchronized, and the cycle is continuous. Output is 140 pieces per hour.

Rationalization of work handling is one of Renault's guiding maxims, and this has been developed to a high degree on the engine assembly line. Bare cylinder blocks are bolted to individual pendant fixtures carried on an overhead monorail. (The actual mounting flange can be swiveled by a hand crank and worm gearing to position the engine at any angle.) They stay on the same fixtures throughout build-up, testing and painting, until they finally snake through the factory to the dispatch area. There they are loaded by conveyor into a specially-designed double-deck articulated truck, which carries 100 at a time to the Flins assembly plant.

Outstanding, too, is the merry-go-round engine test rig, which has 26 beds on a large turntable. Assembled engines are switched from the incoming monorail to one that lies in a circle above the beds. As an engine approaches to hang over an empty bed it is loosely hooked on so that the bed pulls the pendant fixture with it. When pipes for water, fuel, oil and exhaust are attached, the engine is started and run on gasoline during the 15-minute circuit of the table, while the oil continuously flushes out through a drain hole in the bed.

The foundry

Highlights of Renault's foundry is a new mechanized line for engine blocks. Here the blocks are cast in pairs in a single mold, are joined along the pan flange and separated when cold. One advantage of this arrangement: only one core assembly is required. This is made up of 11 pieces for the two blocks, as against nine for one block made by conventional methods.

After the core pieces are initially fitted together, a simple clamp on the overhead traveling hoist picks the 155-lb assembly off the table and carries it to the start of the finishing line, which is an oval circuit with eight trunnion-mounted fixtures. There, the core is lowered and located in an empty fixture, then firmly clamped down with a pair of cross bars.

As the fixture circulates, a worker at each station levels and shapes the various faces of the assembly with a square machined bar scraped along flats in the surrounding frame. To facilitate this, the fixtures are automatically indexed in their trunnions as they approach each station.

At the end of the loop the core assemblies are transferred to traveling fixture for conveyance to the mold. An elevator with a carrier frame at the final station drops this fixture onto the horizontal core (by now unclamped). In its turn the upper fixture grips it and raises it to engage the monorail. Small pushrod cores are manually added to the unit while it is in transit. Then the conveyor (to save space) goes underground, emerging at the mold line, where the clamped assembly is lowered onto the drag and unlocked.

Output of Renault's twin-mold line is 160 engine blocks an hour—as opposed to 120 produced per hour by the old method. A conventional single-mold line still in operation at Renault will be converted to twin-mold operation soon.

Mechanical handling

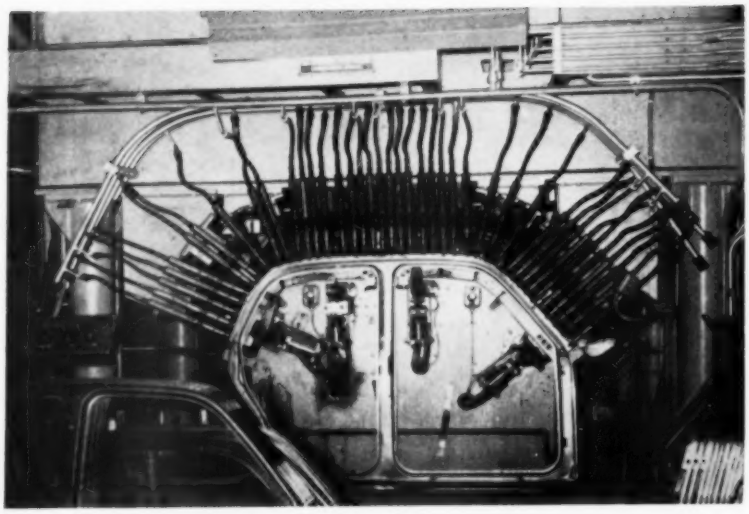
Mechanized work handling is also a principal feature at the Flins plant, 30 miles west of Paris, which is devoted entirely to making the Dauphine body and assembling the car. One of the advanced lines in the press shop is for continuous blanking of shapes for interior mudguard panels. The setup starts with a McKay uncoiler that plays out coiled strip 68-cm wide. It is followed by a straightener, loop pit and feed rolls, also by McKay.

The strip then enters a Clearing 400-ton triple-action press that

punches out a pair of blanks which are ejected into bins on two sides of the die area. Scrap is carried by chute to an underfloor conveyor. Output is 1800 pieces per hour. Like all Clearings used by Renault (except the largest, 1100-ton press), this one is made under license by Berthiez in Lille.

Left and right door frames for the four-door car are formed as a single pressing on a line that begins with the 1100-ton, 4-action Clearing. Handling between subsequent machines is automated by extractors, ejectors, belt conveyors and shuttle loaders.

Similarly, even small crank presses are mostly fitted with a mechanical loader, magnetic holder on the upper die, and an unloading basket which swings under the raised die to receive the released stamping, then tilts it into a waiting bin. Off-cuts from all the presses are carried by basement conveyors to a Lindemann scrap baler, where the operator uses closed-circuit TV to control loading of bales into trucks at the exit conveyor in a remote bay.



Rain gutters are spotted to door frames . . .
on this vertical welding press, which has 40 electrically actuated electrodes arranged in four staggered banks and which operate in an automatic ten-at-a-time sequence. This French-made machine is doubled sided so as to handle left and right frames on completely independent circuits

New welding techniques

Many modern techniques can also be seen in the welding shop. For instance, rain gutters are attached to the door frames on a single multi-spot welding press. After hand-loading in the vertical fixture, the frame is pneumatically clamped in four places and the cycle starts. There are 40 electrodes on individual hydraulic rams spaced along the gutter. These are arranged in four staggered banks on separate hydraulic circuits, each set of 10 being actuated in sequence in order to limit current drain and local heating.

This machine is double-sided to handle left and right frames, has independent electric, hydraulic and air supplies for the two sections. Similar vertical machines weld reinforcements to the front and rear inside mudguard pressings.

Complete side panels for the Dauphine body are built up on duplicate oval welding circuits, each with 19 tilting jigs. The door frame is the first section to be loaded and clamped. To it are added mudguard interiors, bracing members, hinge plates and other prefabricated components. Jigs are supported by trolley-mounted trunnions and can be manually positioned at each welding station to minimize hand and tool movement by the operators. At the end of each circuit, completed side assemblies are finished with 118 spots on La Soudure Electrique rising-bed presses.

Door assembly is also of interest. Inner and outer panels are first mated on a small vertical press. The two stampings are placed in the jig and secured by a pair of air clamps, then tacked together at the corners by four guns.

After being released the door is manually shifted to an adjacent shuttle loader feeding a transfer line built by La Télémécanique Electrique of Nanterre. Here, the first two presses restrike the window frame and door edge respectively, while the third is a multi-spot welder that completes the job.

Body welding

The final body welding line (duplicated to provide necessary output) starts with a series of five heavy jigs. Here the preformed floor with frame members is joined to the rear engine deck and front compartment floor in an inverted position. Jigs are carried on trucks, and at the end of the track a descending platform drops each empty one onto basement-level rails where it is fast-returned to the head of the line. There a corresponding elevator restores it to circulation. Automatic safety gates isolate open shafts from the welders' area.

Floor units are lifted off the last of these jigs by an electric hoist on a monorail. Each is gripped by a clamping device with a jackknife action, which rolls the suspended chassis structure longitudinally through 180° as it moves forward to the next line. The first of the six jigs on this section receives the assembly in a normal upright position, and at ensuing stations the roof, side panels and rear grill are welded on.

Now the bodies are picked off by padded arms hooking under the door frames, and conveyed by monorail to the next welding department, where the underside gets further welds while the work is hung at head-height for ease of access. They are now lowered onto individual platens in the form of simple skid rails placed on a knee-level slat conveyor. In this section the doors, hood and trunk lid are hung, outside mudguard panels are bolted on, sealing compound is injected into exposed joints, and final welding is done.

Completed raw bodies are transferred to a monorail conveyor, but remain on the same platens throughout washing, drying, painting and trimming. They are shifted to front and rear hooks only when the front suspension and steering assembly is attached from beneath. These end supports are also essential at the body drop on the two final assembly lines, where the body glides nose-down over the conveyor until its rear gradually settles on the engine and gearbox and associated axle and suspension units.

Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

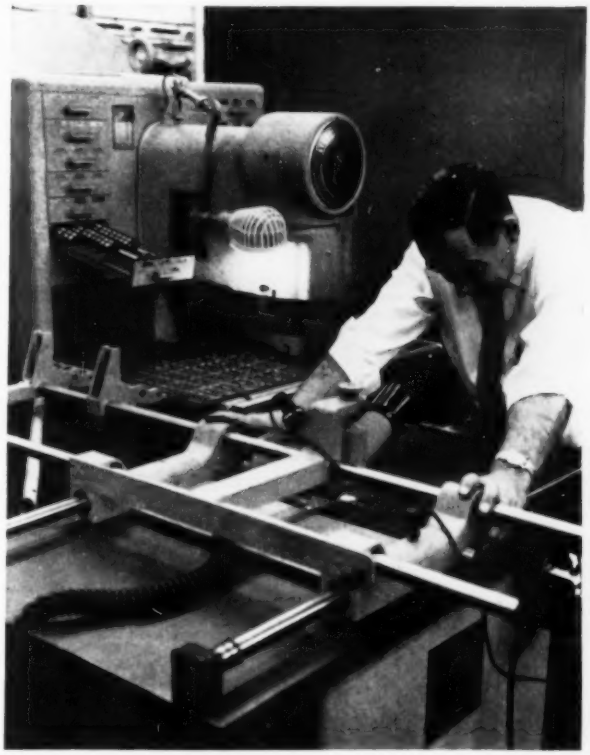
It's so easy to punch hole patterns fast with BTR

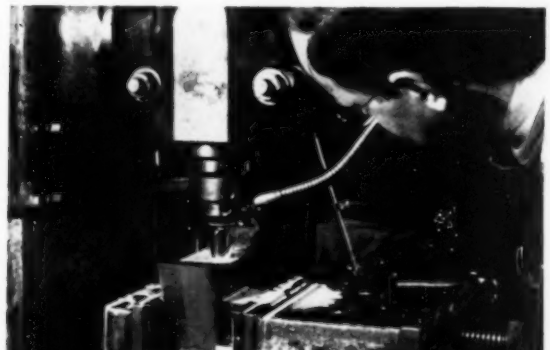
A punch made from BTR tool steel is the key element in this punching mechanism. It speeds the accurate reproduction of hole patterns, by remote control from a template, in sheets of steel, brass, aluminum, or plastic.

The BTR punch has proved both reliable and economical. This is the report from Wales-Strippit Inc., Akron, N. Y., a unit of Houdaille Industries, producers of the equipment. The Bethlehem tool steel is supplied by Leed Steel Co., Buffalo, one of our local tool steel distributors.

BTR is Bethlehem's general-purpose manganese-chromium-tungsten grade of oil-hardening tool steel. It's safe hardening, easy to machine. Combining abrasion-resistance and toughness, it's ideal for a wide range of tool and die uses.

Put BTR to work in your shop. A trial order can be delivered quickly by your Bethlehem tool steel distributor who carries BTR in stock in a wide size range.





New Free-Machining Tool Steel

Bethlehem Air-4 is an air-hardening tool steel which can save you time and money in scores of applications. It is a free-machining grade, and hardens at about 1550F. It combines excellent wear-resistance with a high degree of toughness. Ask your distributor for full data on Bethlehem Air-4.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Decarburized surfaces are the cause of premature tool failures

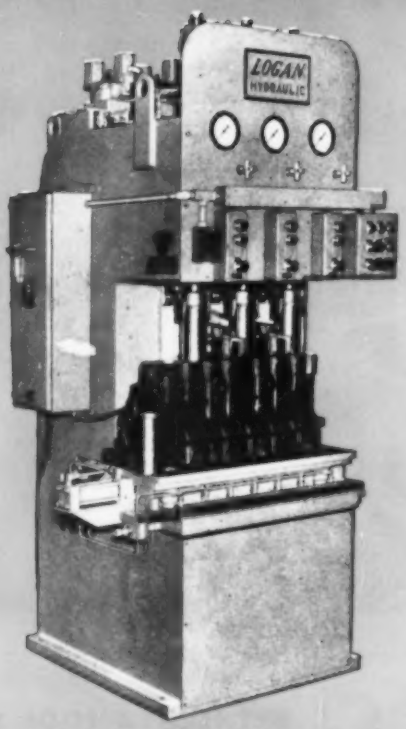
The great majority of toolmakers know that decarburized metal must be removed completely from the working surfaces of tools. It is not so widely known that it is often best to remove this skin from other portions of the tool.

This precaution is especially necessary on tools which are subject to repeated impacts. For example, a pneumatic chisel which has a forged shank often breaks because of a fatigue failure. As a rule there is a stress concentration in the shank, due to the change in section. When this tool surface is also decarburized, rapid failure in service can occur.

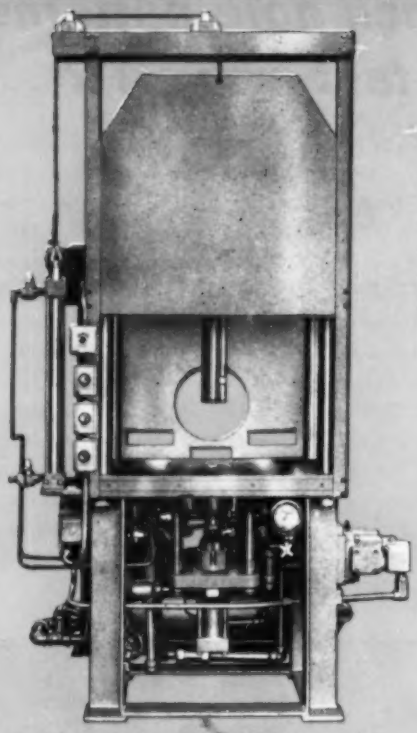
The outer layers of a decarburized tool haven't the strength of the effectively hardened tool steel base. Therefore only one procedure can be considered safe. It is to grind off the "decarb" on *all* tool surfaces.

BE SURE!

Look to Logan



Hydraulic Operated Assembly Press for Pressing Liners in Automotive Engine Block



Hydraulic Operated Die Casting Machine for Casting Electric Motor Rotors

when you require special air or hydraulic-operated equipment for PRESSING • STAKING • FORCING CASTING • FORMING • SIZING

For more than forty years Logan's special services department has engineered and built special equipment to industry's exacting requirements. Logan engineers are always available to help you with your special applications.

for further details ask for bulletin 7-A

LOGANSPORT MACHINE CO., INC.

818 CENTER AVENUE, LOGANSPORT, INDIANA

Logan

MEMBER: Natl. Mach. Tool Builders' Assn.: Natl. Fluid Power Assn.

Carbide Boring Bits—I

These data represent application information developed for production use of solid carbide boring bits

By Carl Neiderfringer, president, The Atrax Co, Newington, Conn

Speeds and Feeds for Ferrous Materials

Stainless Steels (Average Work)

MATERIAL TO BE CUT	1/16 TO 1/8 CUT .010—.030 FEED		1/64 TO 1/16 CUT .007 TO .020 FEED		.007 TO 1/64 CUT .004 TO .012 FEED	
AISI TYPE	SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS
302	140-240	C-7	150-275	C-7	150-300	C-3
303	175-325	C-6	200-375	C-7	200-400	C-8
304	140-240	C-7	150-275	C-7	150-300	C-3
309	140-240	C-7	150-275	C-7	150-300	C-3
316	140-240	C-7	150-275	C-7	100-300	C-3
321	140-240	C-7	150-275	C-7	150-300	C-3
347	140-240	C-7	150-275	C-7	150-300	C-3
403	175-300	C-6	200-350	C-7	200-400	C-8
410	175-300	C-6	200-350	C-7	200-400	C-8
416	175-300	C-6	200-350	C-7	200-400	C-8
420	125-200	C-7	150-225	C-7	150-250	C-3
430	175-300	C-6	200-350	C-7	200-400	C-8
431	140-250	C-7	150-300	C-7	150-350	C-3
440 A, B, C	125-200	C-7	150-225	C-7	150-350	C-3
440 F	125-175	C-7	150-250	C-7	150-350	C-3
446	140-250	C-7	150-350	C-7	150-350	C-3

Steels (Average Work)

MATERIAL TO BE CUT	S.A.E. No.	5/64 TO 5/32 CUT .010—.020 FEED		1/64 TO 1/16 CUT .008—.012 FEED		.005 TO 1/64 CUT .002—.008 FEED	
		SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS
CARBON	1010-1025	275-475	C-7	375-675	C-7	500-1500	C-8
	1030-1095	200-400	C-7	300-500	C-7	400-1000	C-8
FREE CUTTING	1112-1120	275-475	C-7	375-625	C-7	500-1500	C-8
	X1314-X1340	250-450	C-7	350-550	C-7	400-1200	C-8
MN.	T1330-T1350	150-350	C-7	250-450	C-7	300-800	C-8
NICKEL	2015-2320	250-450	C-7	350-550	C-7	400-1200	C-8
	2330-2515	200-400	C-7	300-500	C-7	400-1000	C-8
NICKEL	3115-3140	200-400	C-7	300-500	C-7	400-1000	C-8
CHROME	3145-3450	150-350	C-7	250-450	C-7	300-800	C-8
MO.	4130-4820	150-350	C-7	250-450	C-7	300-800	C-8
CR.	5115-52100	150-350	C-7	250-450	C-7	300-800	C-8
CR. V.	6115-6195	150-350	C-7	250-450	C-7	300-800	C-8
CAST STEEL		200-400	C-7	300-500	C-7	300-800	C-8

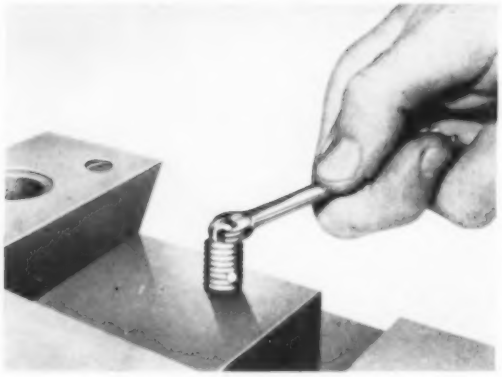
Irons (Average Work)

MATERIAL TO BE CUT		5/64 TO 5/32 CUT .010—.020 FEED		1/64 TO 1/16 CUT .008—.012 FEED		.005 TO 1/64 CUT .002—.008 FEED	
		SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS
CAST IRON	HARD NO ALLOY	225	C-2	250	C-2	275	C-4
	MEDIUM NO ALLOY	250	C-2	275	C-2	300	C-4
	SOFT NO ALLOY	275	C-2	300	C-2	325	C-4
	HARD ALLOY	200	C-2	225	C-2	250	C-4
	MEDIUM ALLOY	225	C-2	250	C-2	275	C-4
	SOFT ALLOY	250	C-2	275	C-2	300	C-4
	CHILLED ROLLS	20	C-1	20	C-2	25	C-2
SEMI STEEL	UP TO 25% SEMI STEEL	250	C-2	275	C-2	300	C-4
	OVER 25% SEMI STEEL	200	C-2	225	C-2	250	C-4
MAL IRON	HARD	200	C-2	225	C-2	250	C-2
	MEDIUM	225	C-2	250	C-2	275	C-2
	SOFT	250	C-2	275	C-2	300	C-2

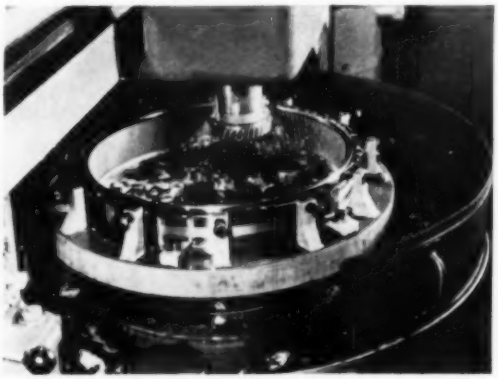
Practical Tooling Tips

No. 4 of a series

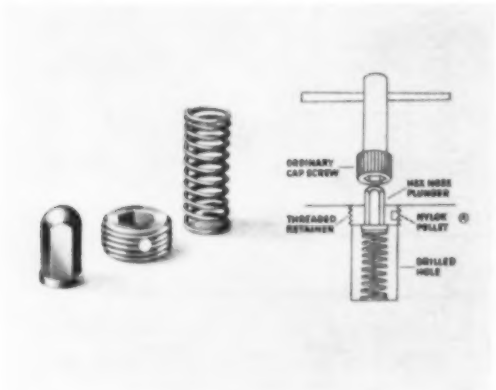
New uses are being found every day for Vlier Tooling Accessories. Perhaps the applications shown below will suggest ways you can profit by replacing costly, custom devices in jigs, dies and fixtures with precision, off-the-shelf Vlier products.



HEX NOSE SPEEDS INSTALLATION OF SPRING PLUNGERS—Vlier Hexnose Spring Plungers are easily installed with a simple end wrench. Eliminates hunting for special wrenches. Made to same exacting tolerances as Vlier Standard Spring Plungers. Available in many end pressures, diameters and lengths.



THIN-WALLED RING GEAR HELD SECURELY in fixture without distortion with 12 Vlier Torque Thumb Screws. Once pre-set end pressure is reached, knurled head spins freely, preventing overtightening. Checknut prevents backing off under vibration. Available in four types; various screw diameters and lengths.



NEW PLUNGER ASSEMBLY PREVENTS DAMAGE TO DIE STOPS—Plunger actuates automatic stop perfectly. Quickly installed, never needs adjustment. Hex nose mates with standard hex head bolts for easy insertion. Nylok® nylon pellet prevents threaded retainer from working loose. 6 sizes from $\frac{1}{4}$" to 1" diameter. Various end pressures.

FREE IDEA BOOKLET—Illustrations in this 16-page booklet show how others have profited from the use of Vlier Tooling Accessories. Shows both the usual and unusual applications. May suggest ways *you* can save. Write for your copy today.

VLIER
Engineering Corporation
A subsidiary of Barry Controls, Inc.
8900 Santa Monica Blvd. • Los Angeles 46, California

Carbide Boring Bits—II

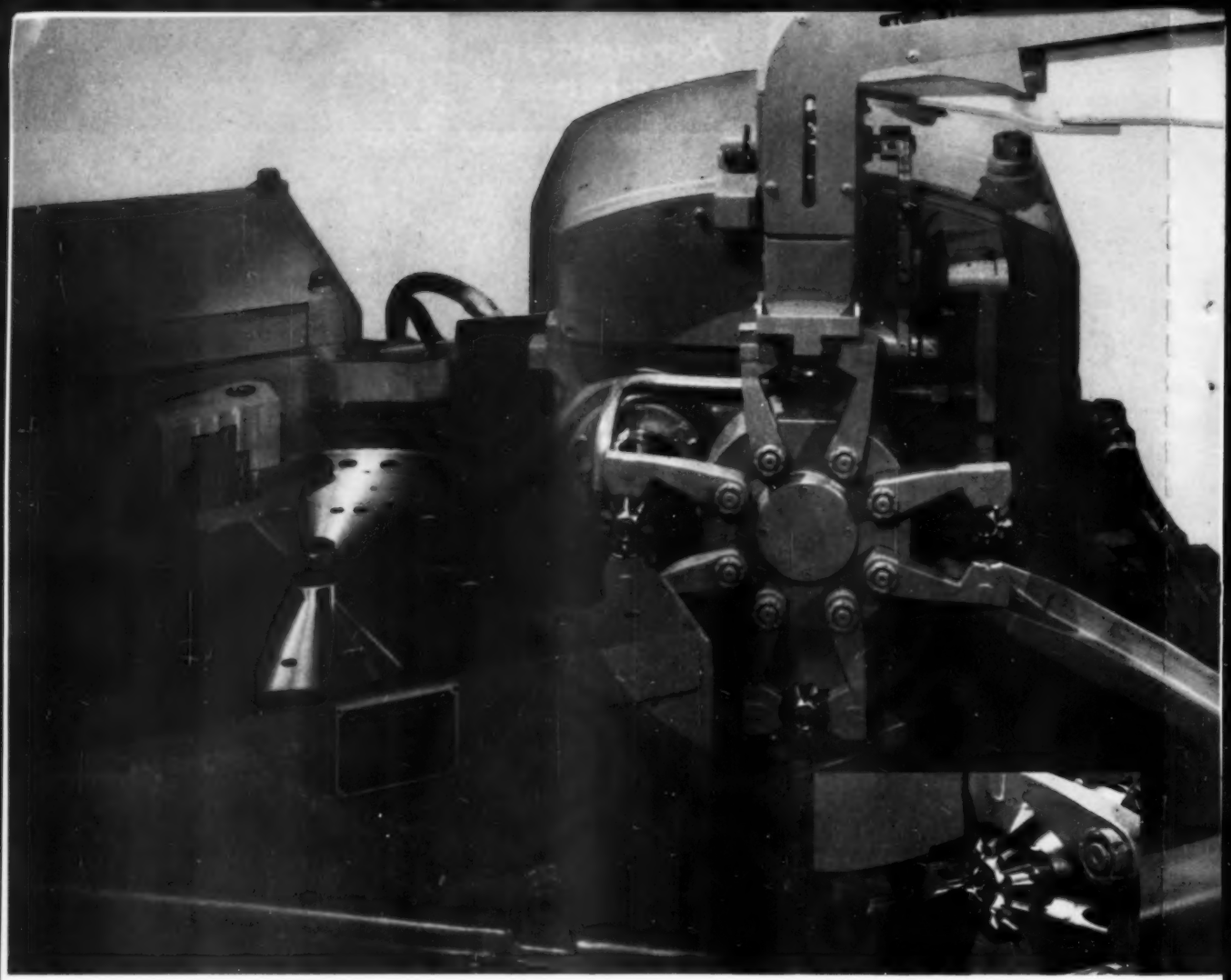
Speeds and Feeds for Non-Ferrous and Non-Metallic Materials

MATERIAL TO BE CUT		5/64 TO 5/32 CUT .010—.020 FEED		1/64 TO 1/16 CUT .008—.012 FEED		.005 TO 1/64 CUT .002—.008 FEED	
		SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS	SPEED FPM	CARBIDE GRADE CLASS
BRASS & BRONZE	HARD	150-350	C-2	200-400	C-2	300-600	C-2
	SOFT	200-400	C-2	300-500	C-2	350-1000	C-2
ALUMINUM	CASTING	250-600	C-2	300-1000	C-2	400-1500	C-2
	BAR STOCK	250-600	C-2	300-1000	C-2	400-1500	C-2
ZINC ALLOYS		250-500	C-2	300-600	C-2	400-1000	C-2
RUBBER	HARD	300-500	C-2	350-600	C-2	400-800	C-3
	SOFT	400-800	C-2	500-1000	C-2	600-1200	C-3
COPPER		200-500	C-2	300-600	C-2	400-1000	C-2
FIBRE		300-500	C-2	300-800	C-2	350-1000	C-2
PLASTICS		300-800	C-2	400-1000	C-2	500-1500	C-2
MONEL METAL		200-275	C-6	200-300	C-6	225-325	C-6

Selection of Chart of Relief and Rake Angles

The angles given are intended to apply to jobs where the tool shank is set perpendicular to the work with the cutting edge on the centerline.

Material	Side Rake (Depth of cut less than 1/4)	Back Rake	Front Relief	Side Relief
SOFT STEEL UNDER 200 BRINELL	8	0	7	7
MEDIUM SOFT STEEL 200-275 BRINELL	8	0	7	7
MEDIUM STEEL 276-350 BRINELL	8	0	7	7
MEDIUM HARD STEEL 351-425 BRINELL	6	0	7	7
HARD STEEL OVER 425 BRINELL	4	0	5	5
CAST IRON	8	0	7	7
BRASS & BRONZE	8	0	7	7
ALUMINUM	8	0	7	7
DIE CASTINGS	8	0	7	7
HARD RUBBER	8	10	7	7
SOFT RUBBER	15	15	10	10
COPPER	15	0	7	7
FIBER	10	0	7	7
PLASTICS	10	0	7	7



In Revacycle Method each blade of cutter is longer than its predecessor; there is no depthwise feed of cutter itself. One rotation of the cutter completes each space from the solid.

Fastest way yet to cut straight bevel gears

If you're looking for a faster, fully automatic way to cut straight bevel gears and pinions with conjugate surfaces and localized tooth bearings, consider the Gleason No. 109 Straight Bevel Revacycle® Machine.

You rough, semifinish, and finish a tooth from the solid blank with a single rotation of the Revacycle cutter.

Now both 21" and 25" diameter cutters can be used on the No. 109 Revacycle Machine. The 25" cutter cuts gears to a maximum depth of 0.600". The 21" cutter will cut to a maximum of 0.400".

A new, completely automatic mechanism loads and unloads each gear. You can feed this loader manually or with a conventional belt conveyer.

The No. 109 Machine handles a wide range of automotive and farm machinery gears: up to 10" diameter, 5:1 ratio, $1\frac{1}{4}$" face width.

Send for our bulletin for information on both the machine and the Revacycle Method.

Storage unit and flight conveyer can be fed manually or with belt conveyer. Even with manual operation, one operator can handle a battery of machines.

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

CIRCLE 247 READER SERVICE CARD

Application of Carbide End Mills

By Carl Neiderfringer, president, The Atrax Co, Newington, Conn

Rules for Use of Carbide End Mills

Materials

Solid-carbide end mills are recommended for milling all types of materials with the possible exception of soft steels.

Milling Set-Up

Climb milling with solid-carbide end mills is possible only with an extremely rigid set-up.

Eliminate Vibration

Hold end mills as close to cutting diameter as possible to prevent excessive overhang which can cause vibration, chatter and scored surfaces.

When to Sharpen

Carbide end mills should be sharpened as soon as appreciable wear lands are noticed.

How to Sharpen

A fine-grit, resinoid-bond diamond wheel is recommended. A true wheel spindle and rigid sharpening setup will determine the production that can be expected from the new cutting edge.

Relief When Sharpening

Too little relief causes the cutter to "drag" or "pick-up" on the heel of the land. Too much relief results in a weak tooth form.

Rake When Sharpening

When necessary to deepen flutes, the flute should be ground to conform to original shape for easy chip disposal. Incorrect flute forms cause clogging of chips, resulting in overheated workpiece and cutter, with eventual chipping and breakage of the tool.

Coolants

Most end-milling operations can be performed dry or with air blast to remove chips. A flow of coolant such as soluble oil or light oil is recommended in some cases, but it is necessary to use a heavy, continual flood to prevent intermittent heating and quenching which may result in hard spots in workpiece.

A heavy flow of coolant or strong air blast is recommended when milling aluminum to facilitate chip disposal, which is otherwise a problem.

A coolant high in cooling action but low in lubricating quality is recommended when milling stainless steels.

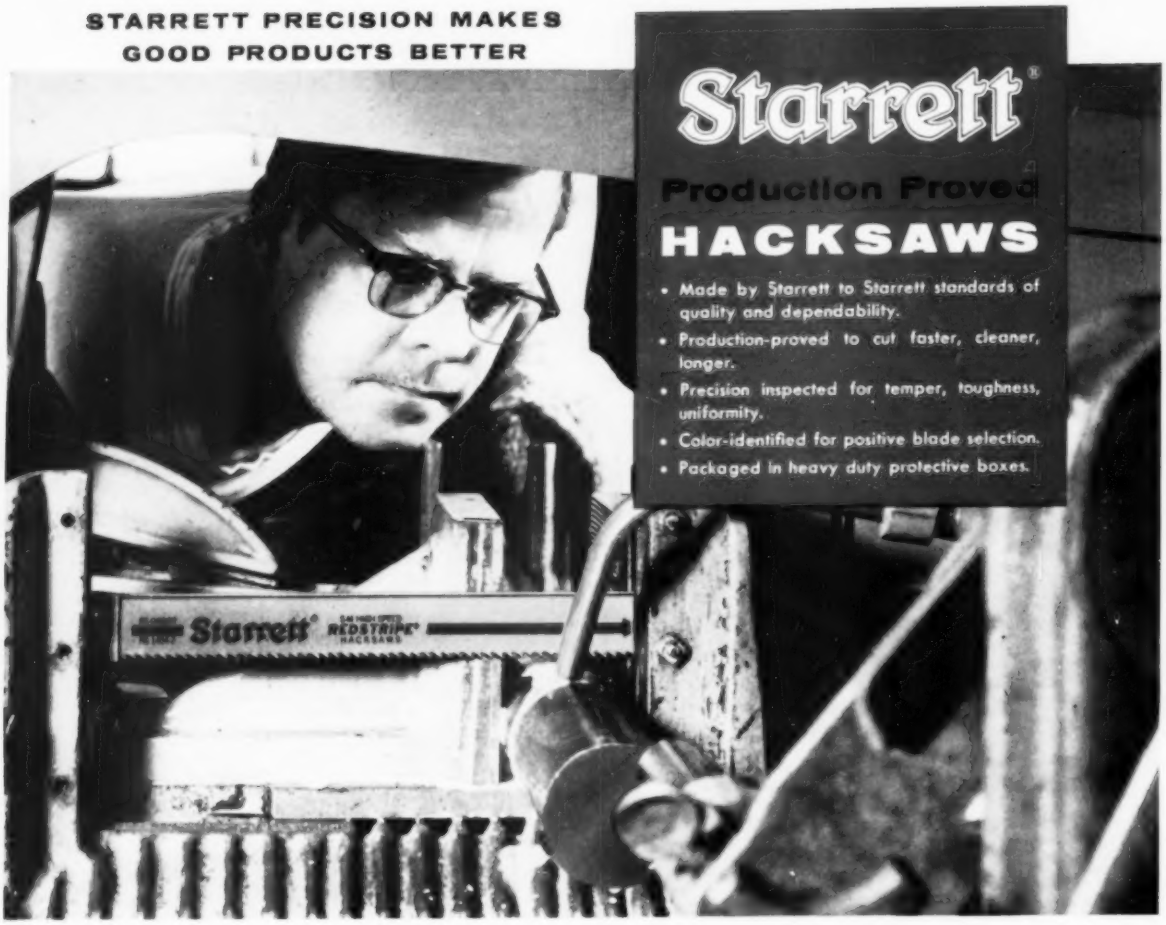
Recommended Applications of Solid-Carbide End Mills

Materials Group	Type of End Mill
Group 1:	
Brass and bronze Aluminum Zinc alloys Copper Hard rubber Fiber Plastics Magnesium	4-flute, right-hand spiral, square end
Group 2:	
Cast Iron	4-flute, straight-flutes, square end or 2-flute, straight-flutes, square end
Group 3: (also see Group 1):	
Aluminum Magnesium	2-flute, right-hand spiral
Group 4:	
Carbon steels Free-cutting steels Nickel Stainless steels Malleable iron Monel Metal Heat-treated steels Titanium	4-flute, slow spiral, right-hand spiral, square end

Speeds and Feeds for Solid-Carbide End Mills

MATERIAL	CUTTING SPEEDS Fpm	FEEDS, Ipm		
		CUTTER DIA Up to 3/16	CUTTER DIA 1/4 to 1/2	CUTTER DIA 1/2 and Over
Carbon steel	90-250	1-4	2-10	3-10
Free-cutting steels	100-300	1-4	3-15	4-15
Nickel	90-250	1-4	2-12	4-12
Nickel chrome	80-250	1-4	2-12	4-12
Stainless steels	70-250	1-4	2-10	4-12
Cast iron	60-200	1-5	3-15	4-15
Malleable iron	60-200	1-5	3-15	4-15
Brass and bronze	100-300	2-6	4-20	6-20
Aluminum and aluminum alloys	125-350	2-8	4-20	6-30
Zinc alloys	150-400	2-8	4-20	6-30
Copper	125-350	2-6	4-20	6-20
Hard rubber	150-500	3-12	4-30	6-40
Fiber	150-400	3-12	4-30	6-40
Plastics	200-600	3-15	6-40	10-50
Monel Metal	100-250	2-10	4-20	6-30

STARRETT PRECISION MAKES GOOD PRODUCTS BETTER


Starrett
Production Proved
HACKSAWS
• Made by Starrett to Starrett standards of quality and dependability.
• Production-proved to cut faster, cleaner, longer.
• Precision inspected for temper, toughness, uniformity.
• Color-identified for positive blade selection.
• Packaged in heavy duty protective boxes.
Starrett
REDSTRIPE

Watch your cutting costs go down when you specify

STARRETT *PRODUCTION PROVED* HACKSAWS

You know in advance what Starrett hacksaws will do. Each blade type has been developed for a specific range of cutting jobs, thoroughly *production-proved*, manufactured to Starrett quality standards and *clearly color-identified to simplify correct blade selection.*

Years of saw making experience and development research are summed up in this simple color code that lets shop men select Starrett hacksaws the way they select metals — each matched to the job at hand. By specifying *Starrett* when you buy hacksaw blades, you get production-proved performance that makes cutting costs go down.

Your nearby Industrial Supply Distributor has them. Call him for quality products, dependable service. Or write for Starrett Saw Catalog. Address Dept. C. The L. S. Starrett Company, Athol, Massachusetts, U. S. A.

THE RIGHT BLADES FOR LOW COST, FAST CUTTING, LONG LIFE

STARRETT REDSTRIPE SM — high speed power and hand blades specially tempered for cutting hard materials with heavier speeds and feeds.

STARRETT GREENSTRIPE SAFE-FLEX — high speed hand and welded edge power blades — shatterproof, unbreakable, the safest blades for heavy feeds, gang sawing, interrupted cuts.

STARRETT BLUESTRIPE — selected high speed steel power and hand blades especially heat treated for high speed production sawing and hard-to-cut metals.

Starrett
PRODUCTION PROVED
HACKSAWS
World's Greatest Toolmaker

STARRETT TOOLS

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

Visit the Starrett Exhibit, BOOTH 420, Quality Control Show, Cleveland

Talking Shop...

Throwaways

Is THERE ANYBODY left who doesn't know about the savings you can usually make with throwaway tools? Kennametal reports recently a case where rough boring of bronze castings caused frequent tool breakage. A change from brazed tips to heavy insert tools raised the output from 18 castings per tool, including five regrinds. Inserts managed an average 100 parts per edge, with eight edges to work from. Including the cost of the holder, tool cost per casting dropped from 78¢ to 0.4¢. This is an unusual case, perhaps, because of the scaly nature of the surface, but it indicates the remarkable savings people frequently get with inserts.

Quality, FOB

A YEAR OR SO back there was a surge of complaints about the poor quality found in so many manufactured products turned out by metalworking plants. You may recall that we added our own voice to this chorus on occasion. The main brunt of the criticism was aimed at appliance and auto plants.

It seems only fair to note that a lot of effort has been put forth to do something about it. As one example, we were impressed by the Ford program we were told about by Milo Dean at SAE's recent National Production Meeting.

A key step is the "quality audit." Half the battle was establishing standards. What, for example, is the "right" door closing effort when the same door will be closed by a child and his parents?

At each plant an audit team makes a random selection of cars that have passed plant inspection and makes and records visual or operational checks on 1500 different items. Each defect has a point rating—a scratch is 2 points, a major item 10 points, an incidental imperfection is 0.2 points, etc. This audit provides a daily quality rating for each plant.

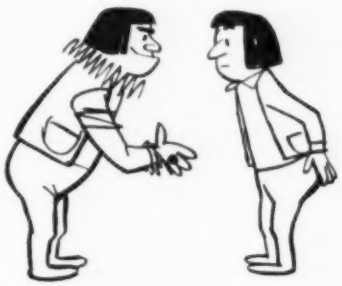
There are several other elements to the program, including a one-year detailed study of repair records on a statistical sample of cars in the hands of customers. But in the last analysis quality of the product depends on the worker on the line. As Milo Dean puts it, "potential quality comes in on two legs every morning."

N C Dissent

DESPITE THE GREAT advantages of numerical control, there are some fields where its use may possibly detract from accuracy or flexibility. Says one machine tool builder: "We are vitally interested in applying tape control to our product, which works to tenths. So far we have not seen a system that would not subtract its tolerance from ours, thereby negating several years of development work." The manufacturing engineer of a large autoframe plant prefers not to use tape-controlled automatic arc welders for a different reason. Each frame has a number of odd paths that the welding heads must follow. To be on the safe side, he makes a lab check for welding setups on different joints, then applies the data to semi-automatic welders. It is his feeling that a fully automatic machine operating under tape control may be costly to change over when the yearly model changes on products introduces other difficult joints. We think this last man has failed to grasp a main advantage of tape control: it is easier to change over, is best for short runs. There is one welding machine (*AM*—Oct 6 '58, p88) that makes its own new tape for *every* part.

MEMOS

by BESS RITTER



Few mechanisms have been as ingeniously vicious as the famous "poison rings" which the members of the famous Italian Borgia family of the late 15th and early 16th centuries used for exterminating their enemies:

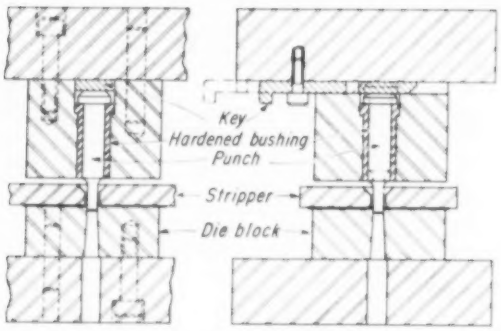
> **One had a sliding panel concealed beneath the bezel, and when the panel was moved, a cavity was revealed, which was just right for the insertion of a good supply of poison. This motto was appropriately engraved on the ring, "Do your duty, happen what may."**

Another much more "friendly" mechanism was built in a ring which had its bezel designed in the realistic shape of a lion. However, its claws were hollow, and a hollow passageway led from here to a small poison reservoir in the back of the entire figure of the lion itself. Now, by unobtrusively turning the lion so that it faced the wearer's palm, the claws could be raised so that they'd stand far enough away from the ring itself to make a decisive puncture in human skin.

> **This puncture was immediately flooded with poison, from the reservoir, via a tiny but effective mechanical device. All the wearer had to do when he was interested in exterminating a particular "friend" was to turn his murder-ring with his other hand, then grasp his victim's hand firmly to accentuate his greeting.**

Practical Ideas...

Slide Keys Operate Punches



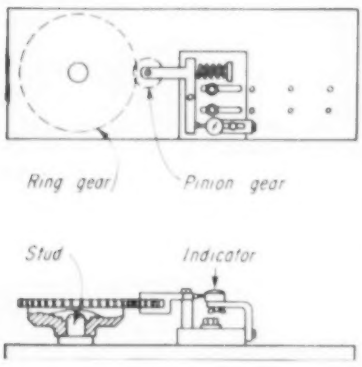
The quickest way to activate or deactivate punches in a die which is to produce parts with variations in hole locations, is to employ slide keys and retractable punches. One of these keys can be made to place one or several punches in and out of operation.

Shown in the drawing is one station of a die in which we incorporated this feature. With these arrangements placed at required locations, we are able to turn out parts having the same contours but with different hole patterns. From the tool maker's standpoint, construction will require more care and time, but once the die is in production this will prove to be well expended.

Boring up and counter boring the punch holder to receive a hardened guide bushing, and a key slot milled across the top centered over the guide bushing, completes the additional work required on the punch holder. A snug sliding fit of the punch in the bushing is necessary to keep punch in alignment as well as retracted when not backed up by the key.

The key, with its front end fashioned in a 45° bevel, is made to slide fit into the slot of the holder. Two holes are drilled through the key, one for locking it in active position and the other to lock it when open. We have found two separate locking holes safer than one elongated hole in the event the screw should loosen from vibration.

E H Stock, St Louis, Mo



Fixture Checks Ring Gears

One line of our production is in various types of auto and industrial-engine flywheel assemblies. These are for replacement orders only so our output is not on a large scale.

Working on the assumption that the purchased ring gears were in good order, we merely shrunk them onto the flywheels. However, some rejections showed up because the pitch dia of the gear was not concentric with the flywheel diameter. An inspection setup was therefore necessary to check each assembly before shipping if we were to maintain good customer relations.

To check the pitch or diameter of unmounted gears would be useless, and to devise an apparatus to properly inspect them before mounting would be too expensive. The small number of rejections we received made such an outlay unwarranted.

The illustrated fixture makes it easy to verify concentricity after a gear has been mounted on the flywheel. When discrepancies are found they are easily corrected before the assembly leaves the plant.

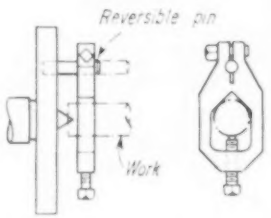
The fixture consists of a base plate carrying a mounting stud and an inspection unit which is made up on a pad with a pinion-gear bracket and indicator holder. This pad has two elongated holes, and the fixture base has several tapped holes for adjustments to accommodate flywheels from the smallest to the largest diameter.

To inspect a gear, the flywheel is dropped onto the stud while the pinion is being held back. The pinion is then allowed to engage the ring gear and adjustments are made to zero out the indicator. The gear is next slowly rotated while the indicator is observed for deflections beyond the permitted tolerances. With the aid of a master gear, (for the purpose of setting the indicator) the diameter of this and other types of gears are quickly checked.

Richard G. Gavaiani, Iron Mountain, Mich

Reversible Lathe Dog Speeds Changeovers

Although a lathe dog is the best way to drive a shaft being machined between centers, it does have one drawback. It usually occupies one section



of the shaft that, likewise, must be machined. When this is the case, the dog has to be removed from the shaft, then reversed and placed on the other end. If the shaft is long and a bit heavy, this job can be unnecessarily awkward.

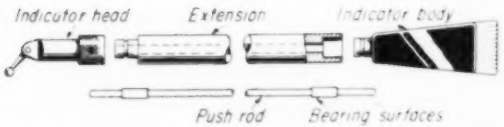
A driving dog that would not have to be removed from the shaft, and could still be reversed, should therefore have some advantages. The illustrated lathe dog is such a driver.

When the work is ready to be reversed on the centers, the pin is released and pushed back to project on the opposite side of the dog. After again locking the pin, the dog is loosened and moved to the other end of the shaft. The dog will now be in position to engage the faceplate when the shaft is turned end-for-end on the centers.

Being made from steel plate, the dog is sawed out as shown. The hole for the pin is drilled and reamed after which a clamping slot is sawed through its center. A clamping screw, entering edgewise and across the slot, provides clamping pressure.

F Murray, Chicago, Ill

Indicator Extension Simplifies Deep-Bore Setups



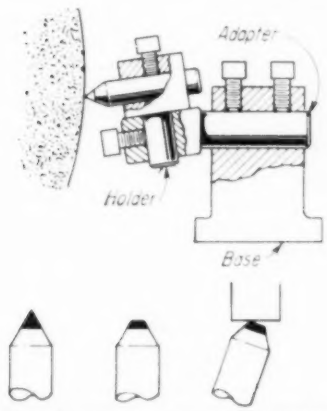
One job that is always tough to set up is a small-diameter deep bore in a piece which has no concentric OD or accurate angular face to work from. Reaching inside with an indicator, to correlate the deeper portions of the bore with its outer edge, is only effective as deeply as the indicator dial can be observed.

When we recently had to perform a second operation in bores $3\frac{1}{2}$-in. deep, we made the illustrated extension for a Starrett No. 564 indicator to assist us in getting both ends of the bore true. This extension is longer than we required for the job at hand, but after finding it OK we left it at this length for future use in deeper bores.

The indicator, being of the push-rod type, has a removable tip-carrying front section held in place with a setscrew. After removing this part, the extension piece was bored to fit onto the indicator body and provided with a setscrew for securing it. The other end was turned down to accept the tip section.

A 3/32-in. hole was then drilled through the entire length of the extension. This had to be done very carefully to keep the hole straight and concentric. The push rod was made from 3/32-in. drill rod which was relieved at both ends and also in two intermediate sections, thus leaving only three $\frac{3}{8}$-in. long bearing surfaces. After making necessary adjustments (as to rod length) the parts were assembled and the indicator was ready for use.

Benjamin Lechler, St Louis, Mo



Wheel Dressing Improved With Adjustable Diamond Holder

With a single-position diamond holder, a diamond begins to lose its efficiency when the point has worn flat. Under these conditions the diamond can no longer function properly, the grinding wheel is not properly dressed, and the surfaces ground with such a wheel are of low quality.

On the other hand, were the holder radially adjustable it would be possible to swing the diamond and present a fresh edge to the wheel surface whenever needed. With this thought in mind we designed the holder shown in Fig. 1. Applied as shown in Fig. 2 it is easy to make proper and effective use of the entire diamond.

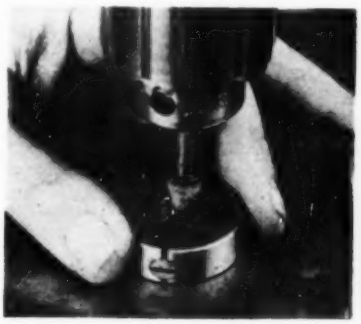
The tool consists of a base carrying the shaft of a holder adapter. This adapter, in turn, supports a revolving diamond holder. The adapter shaft is locked in the base with two setscrews and need seldom or never be disturbed. Adjustments are made by loosening the screw unlocking the holder shaft after which the holder is positioned to present a sharp diamond point and the screw is again tightened.

Rino B Zanardelli, Brescia, Italy

How to Sharpen a Button Die

When a one-piece thread-cutting die, or button die as it's most commonly called, becomes dull, it loses its efficiency and chasers are easily broken, whereupon it has to be discarded. This is wholly unnecessary as these dies can be sharpened many times before they must be replaced.

One simple, yet practical, method is illustrated. A small shank-mounted grinding wheel is gripped in the drillpress chuck which is set up to rotate at a high speed. The wheel must only be slightly smaller than the diameter of the relief holes to maintain the rake angle of the cutting edges.



The die is then laid on the drillpress table or, better yet, on a steel plate with a clearance hole centered under the wheel. After lowering the wheel into one of the relief holes, the spindle is locked. During the rotation of the abrasive wheel, gentle pressure is applied with the fingers on the opposite side of the die. This brings the wheel in contact with the cutting edges cleaning up any dull or chipped teeth. (A reciprocating action of from 30 to 40 strokes per minute, instead of locking the spindle, may improve the finish. Ed)

H J Gerber, Stillwater, Okla

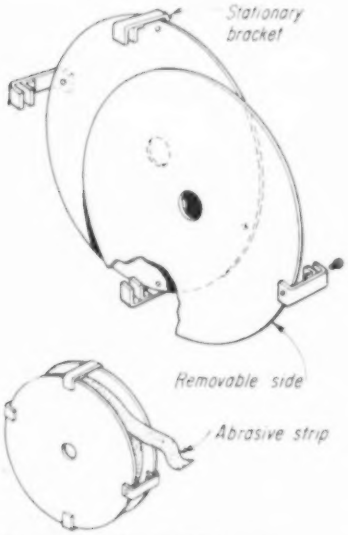
A Spotting Blue Substitute

Did you ever find, after having left the shop to do a job on the outside, that you had left your tube of Prussian blue behind? Yes. Then you know that this can be an aggravating situation when parts must be carefully fitted, one against the other, by the spotting-in process.

When we recently found ourselves in this predicament we were fortunate enough to discover a substitute. From a nearby office we managed to borrow some carbon paper on which we put a few drops of oil. This lightly saturated paper was then smeared on the surface to be spotted in. The substitute worked well and the job was finished without a delay.

Albert Bonosky, foreman, Westinghouse Electric Co, Buffalo, NY

Practical Ideas...



Abrasive Cloth Dispenser Improves Efficiency

Most toolrooms today use abrasive cloth in strip form because of the added convenience and ease of handling. There's only one little problem; that of dispensing the material. When a man takes a strip off the large roll, he usually takes a piece 2 or 3 ft long so it will last for a while. A lot of this is wasted by the rough handling it gets on the job.

Because, at the most, only a few inches is needed at a time, I constructed the dispenser shown which helps me keep abrasive cloth handy at all times. One of these dispensers can hold yards of abrasive strip and it won't take up much room in a tool box. Or, if preferred, several dispensers can be slipped onto a rod suspended above the bench to hold various abrasive grits.

Two disks, made of either brass, aluminum, or galvanized iron, make up the side pieces. Each is drilled with a center hole if the dispenser is to be mounted on a rod. Short lengths of channel are cut to be used as brackets to hold the side pieces one of which is removable. Grooves are formed, to take the removable side, by soldering small angles to the inside of the channel. Three channels are then secured to the stationary side by rivets or solder. The fourth is held in place with a screw so that the removable side can be slid out for loading.

Fred M Brewer Jr, Winston Salem, NC

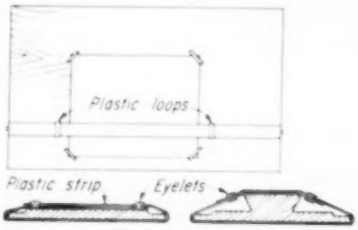
Magnets Mount Work Drawing

Many shops, like ours, have no convenient place to put a working drawing for reference during machining operations. When they are laid on a bench near the machine, small hand tools invaribaly have a way of winding up on the drawings or under them. As a result, the drawings become illegible from oil stains and smudges and are messy to file for future use.

To remedy this situation, we have attached wide strips of steel to the walls behind, and a little to the side of each machine. This arrangement allows small magnets to hold the prints at eye level for easy reference, but out of danger of oil spray and smudges caused by handling.

The thickness of the steel attached to the wall makes no difference to its magnetic attraction, any scrap obtainable will do. For the sake of uniformity, we secured the strips for all machines at the same eye-level distance from the floor.

William DeGroat, Altadena, Calif



Plastic Strips Save Drawings

Draftsmen using masking tape to hold drawings to the drawing board will sometimes find the straightedge catching the tape, rolling it up and tearing the drawing.

This problem can easily be solved by slightly elevating the straightedge so it won't touch the tape while being moved across the drawing. I did this with the aid of two strips of plastic, formed and riveted with two small eyelets as shown.

The strips are 1-in. wide and 0.020 to 0.030-in. thick. They are shaped, after having been made pliable in hot water, to suit the sectional contours of the straightedge. When the eyelets have been installed, the loops are slid onto the straightedge and placed at from 2 to 3 in. outside either side of the drawing.

W. T. Roberts, asst chief draftsman, Machlett Laboratories, Springdale, Conn

Edward J Zoeller
Louisville, Ky

$25 In addition to regular payment for his idea:

WORK LOCATOR IS UNIVERSAL

in the Feb 23, 1959 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

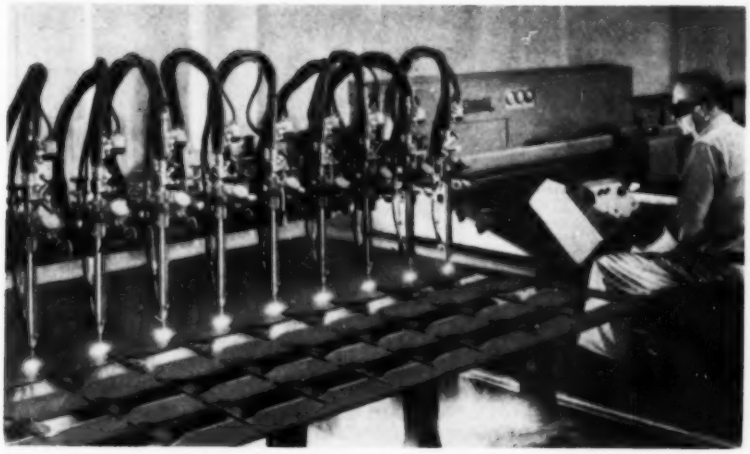
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

New Shop Equipment
Materials and Parts



Shape-Cutting Machine With Photocell Tracer Automatically Compensates for Kerf Width

A fully automated, unlimited capacity shape-cutting machine, known as the Oxweld CM-60, is claimed to be the world's first large-capacity cutting machine with a photoelectric tracing system that automatically compensates for kerf width, and the first American-made cutting machine to have co-ordinate drive.

Parts can be reproduced from an exact size drawing without making allowance on the drawing for kerf width. The kerf compensator is set for the plate thickness being cut, and parts are reproduced exactly the same size as the pencil or ink sketch.

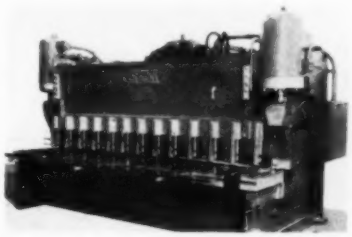
Powered by two electrically coordinated heavy-duty motors, the Oxweld CM-60 can flame-cut intricate parts of any length, width, or thickness. Standard models can be equipped with 10 torches to cut widths up to 10 ft. Thickness of metal that can be cut is limited only by the capacity of the torches.

An automatic height adjustment control on the motor of each cutting torch rides the plate in front of the torch. It senses any deviation in the levelness of the plate surface and raises or lowers the torches accordingly.

All cutting operations are controlled by one operator at the control panel which handles tracing, ignition, preheat, cutting oxygen, torch height adjustment, carriage movement, and tracer positioning.

Linde Co, Div of Union Carbide Corp, 30 E 42nd St, NY 17, NY

MORE DATA? Circle 51, inside back cover



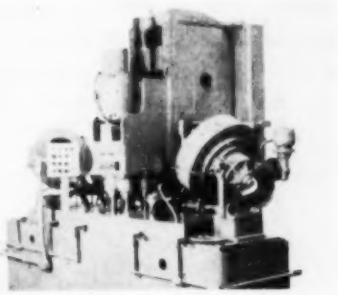
Hydraulic Shear Cuts Up to 12-ft-Long 1½-in. Mild Steel

New line's shear capacities (standard models) range from 8-ft lengths of ⅜-in. mild steel through 12-ft lengths of 1½-in. Special capacities are available to meet requirements. Shears, will process any material within capacity, and reportedly will produce a better edge than can be obtained with a mechanical shear of comparable capacity.

Units are designed with a minimum shear angle of 1-1/6 in. per ft, eliminating curling of the sheared piece, useful when working with light gage materials. Models are equipped with automatic control to keep ram operating at a predetermined shear angle, adjustable by a handwheel located at the operator's station. Power-operated back gages are controlled and operated from the front; shears are also equipped with a front gage and a squaring arm for precise alignment of stock. Ball transfers in the bed allow easy movement of stock. When properly aligned, stock is held in place by hydro-pneumatic hold-downs. Stroke control, with limit switches both top and bottom, is adjustable through the entire range. When narrow pieces are sheared, stroke can be easily shortened to obtain greater productivity.

Verson Allsteel Press Co, 9300 S Kenwood Ave, Chicago 19, Ill

MORE DATA? Circle 52, inside back cover



Unit Tapping Machine Offers Completely Automatic Operation

Unit-type tapping machine, Model 409-S, provides completely automatic tapping operation. It consists of a vertically mounted four-spindle leadscrew tapping unit, two motorized hoppers and feed mechanisms, and four fixtures, all mounted on a common cast iron base with a platen face machined on top.

In one application where the machine processes ½-in. electrical conduit locknuts, it selects, positions, loads, taps, and ejects 1215 pieces per hour at 80% efficiency.

Operating the taps at 35 sfpm, the

machine has a cycle time of approximately 9.5 seconds. It is powered by a 15 hp, 1200 rpm motor.

Morris Machine Tool Co, 2011 Eastern Ave, Cincinnati 2, Ohio

MORE DATA? Circle 53, inside back cover

Synthetic Material Developed For Investment Casting Patterns

Synthetic, wax-like material for investment casting patterns has high strength, ability to fill out the smallest radii completely, and dimensional stability from large to small sections without distortion.

Pattern Materials Div, J I Holcomb Mfg Co, Indianapolis 7, Ind

MORE DATA? Circle 54, inside back cover

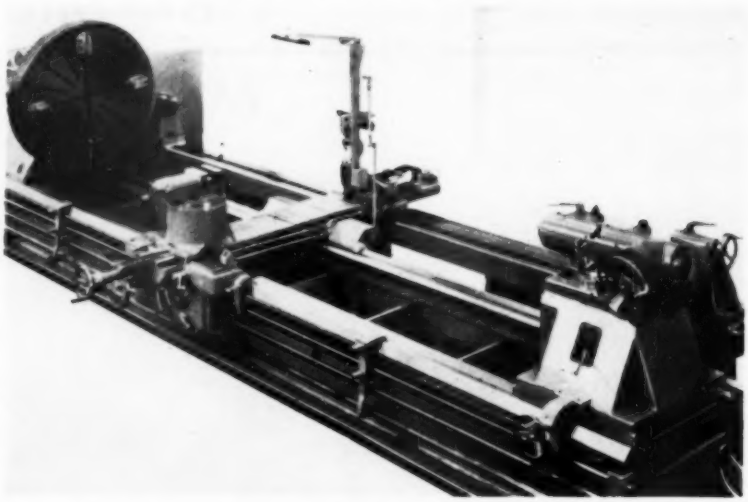
Johansson Radial Drills Offered In Increased Range and Capacity

Both range and capacity of the 1, 2, and 3-hp models have been increased. Machine incorporates two work stations accessible through 360° rotation of ram. Rear work platform, for handling tall pieces, has been enlarged to 21½ x 24 in. Adjustable table at front of machine is now available in two sizes, 20 x 28 in. and 20 x 40 in. Three T-slots and a coolant trough are incorporated in the tables. Sliding radial arm can be moved to within 5 in. of column or out to drill to center of 5-ft circle. Vertical movement of the column permits a max of 53 in. from spindle to working surface, 3½ in. minimum.

Direct gear drive provides 8 spindle speeds which can be selected without stopping motor. Speed ranges have been increased to cover a range from 60 to 2400 rpm. Drill capacity up to 1¾ in. in cast iron is offered. No. 4 Morse taper spindle travels 6 in.

I O Johansson Co, Skokie, Ill

MORE DATA? Circle 55, inside back cover



Sidney Space-Master Lathe Line Features Center Distances to 50 ft, Swings to 72 in.

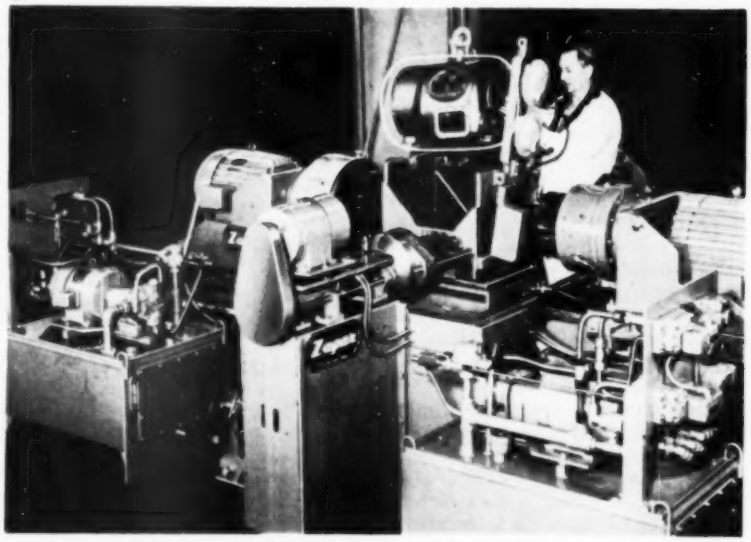
Designed for precision machining of missile components and other large parts, lathes in the Sidney Space-Master series are available with center distances up to 50 ft and swings up to 72 in.

They are equipped 16-spindle-speed headstocks with lapped herringbone gears, an exclusive feature according to the manufacturer. Sixty ratios are standard for thread and feed changes and for infinitely variable speeds the lathes can be supplied with dc motor drive. An improvement over conventional lathe beds is claimed by the use of a separate rack for the tailstock pawl.

Lathes in the new series are available with the Sidney fluid tracer, which uses either flat or round templets and is operated through a separate power unit.

Sidney Machine Tool Co, Sidney, Ohio

MORE DATA? Circle 56, inside back cover



MULTI-HEAD, MULTI-SPINDLE DRILLING MACHINE drills three patterns on each of four drill heads. The patterns are changed by removing the non-operating drills when the casting and fixture are changed from one job to another. A total of 108 holes is drilled by the machine, which also introduces heavy-duty 20-hp feed units—*Zagar, Inc, 23886 Lakeland Blvd, Cleveland 23, Ohio*

MORE DATA? Circle 57, inside back cover

Vacuum Resistance Furnace Can Be Used in Lab or Shop

Reported to be the first high vacuum resistance furnace with the hot zone capacity to handle production and laboratory work, the Model 2915 operates at temperatures up to 4400F and pressures of 10^{-5} mm of mercury.

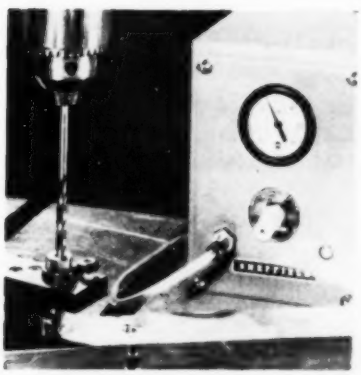
It is designed for heat-treating, brazing, sintering, and testing reactive metals and ceramics.

This internal element furnace has a heating unit 6 in. dia by 10 in. high. Heating takes approximately 6 minutes and cooling takes 20.

Vacuum is obtained by a 30 cfm rotary gas ballast pump for roughing operation, and a 6-in. high vacuum oil diffusion pump for evacuation in the higher ranges. For faster pump-down and high speeds in the 10 to 200 micron range, the unit is available with 16-in. diffusion pumps and over-all capacities of 10,000 cfm.

NRC Equipment Corp, 160 Charlemont St, Newton 61, Mass

MORE DATA? Circle 58, inside back cover



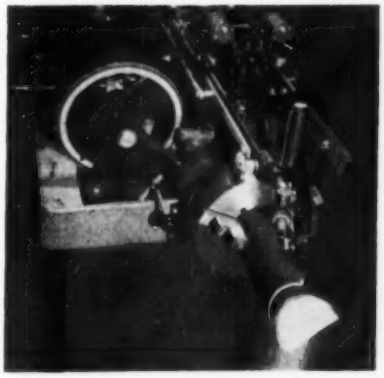
Pneumatic Detector Spots Broken or Missing Drills

This pneumatic drill detector, for use with single or multiple station automatic drilling machines, spots broken or missing drills and supplies a signal for machine shutdown. It can also be used to detect broken reamers, taps, and other types of tools.

Using an air nozzle mounted to a bushing plate, the detector plays a stream of air against each drill. A broken or missing drill causes a pressure drop in the pneumatic circuit which initiates an electrical impulse to operate signal lights and relays. The device is unaffected by dirt or coolant.

Sheffield Corp, Dayton 1, Ohio

MORE DATA? Circle 59, inside back cover



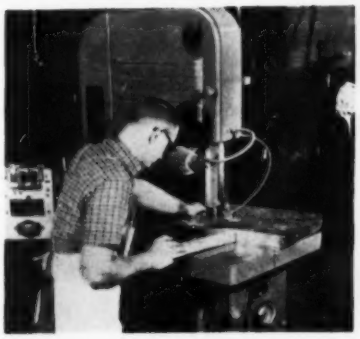
Automatic Contour Cutter Eliminates Use of Forged Fittings

Machine, reported to save up to 75% in time and material for joining pipe and fabricated parts, is designed to virtually eliminate use of forged fittings. Initial setup can be done in 15 seconds; cutting at a rate of 20 ipm, a 6-in. aluminum pipe can be contoured in 20 seconds.

Pipe is clamped into a 3-jaw chuck and pertinent information fed into the controlling mechanism. Pushing a button activates the operation and the most complex contour is automatically cut without use of templets, layouts, or patterns. Sections requiring straight, mitered, or contoured ends are quickly prepared with proper bevels for welding. Cutting head is equipped with an oxyacetylene torch for cutting carbon steel, or a Linde Heliarc for cutting aluminum, stainless, copper, cast iron, magnesium, and high alloy steels. Companion piece, operating on the same principles, is available for cutting holes, circles, and elipses. Range of models available permits handling of pipe from 2 to 24 in. in dia.

Steffan Mfg Corp, 276 S Lincoln St, Salem, Ohio

MORE DATA? Circle 60, inside back cover



Bandsaw With Variable-Speed Drive Cuts Variety of Materials

This 20-in. bandsaw features a variable-speed drive and will cut a variety of materials from stainless steel to plastics.

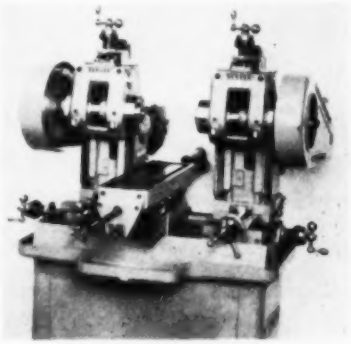
The variable speed drive lets the operator choose from a speed range of 50 to 4500 fpm, insuring the correct speed for cutting any of 58 different materials.

Newly designed blade guides are said to provide up to 100% more blade life. The top blade guide supports the blade down to the top surface of the work and the lower guide supports the blade to within 13/16-in. of the lower surface of the workpiece.

Table measures 24½ in. sq; bandsaw has a blade-to-column capacity of 19¾ in.; maximum height under top guide of 12 in., and height under upper wheel guard of 12⅛ in. Prices start at $820.

Rockwell Mfg Co, Delta Power Tool Div, 455 N Lexington Ave, Pittsburgh 8, Penna

MORE DATA? Circle 61, inside back cover



Dual Head Milling Machines Handle Variety of Operations

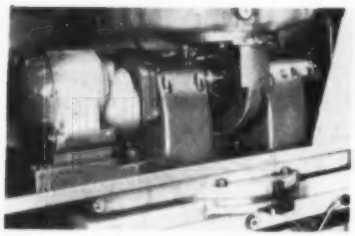
Dual head milling machine, designed to handle a variety of operations, has a total of seven movements that can be operated air hydraulically.

Travel distances are: 2¾ to 11 in.

between columns; 3¼ in. front-to-rear column movement; 2 to 8 in. clearance between head and table top. Table is 20 in. long, 6 in. wide and has a 10-in. travel.

Barker Engineering Co, 500 Green Rd, Cleveland 21, Ohio

MORE DATA? Circle 62, inside back cover



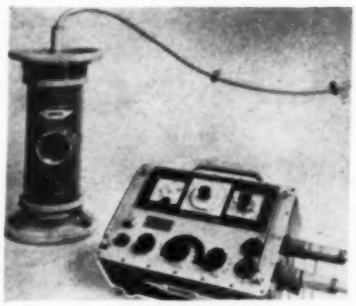
Shaving Process for Gears With Small Numbers of Teeth

Red Ring rotary process said to provide accurate control of surface finish, profile, and lead on gears having 12 or less teeth makes use of a precision rotary gear shaving cutter made in the form of an internal helical gear. Arrangement provides increased surface contact between the cutter and work gear profiles because of enveloping action of the cutter.

Application requires that a different drive arrangement be applied on the shaving machine: instead of the cutter driving the work, the work gear drives the cutter. Work gear is mounted in the headstock in mesh with the cutter. Tailstock center is advanced to the work and locked, then shaving cycle is initiated by pushbutton control. Work gear is rotated while being traversed back and forth in mesh with the cutter along a line parallel to the centerline of the gear, then is fed upward either manually or by an automatic differential upfeed mechanism until proper tooth size is reached.

National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich

MORE DATA? Circle 63, inside back cover



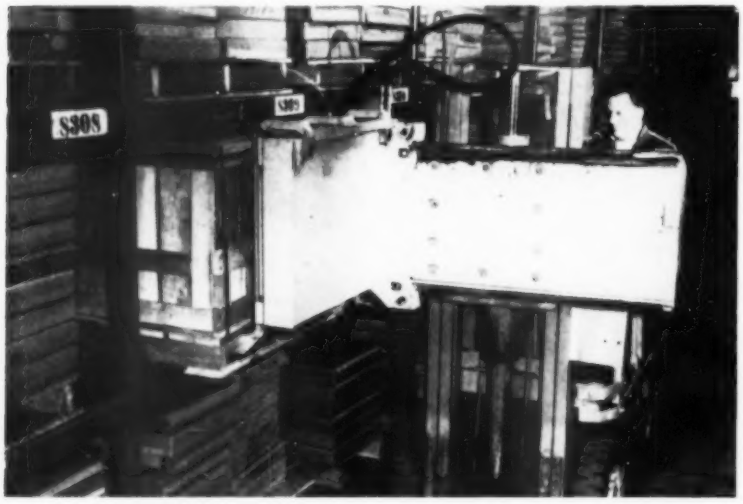
Portable X-ray Unit Developed For On-the-Job Inspections

The Andrex 140 kv X-ray unit consists of a 55-lb control and a 50-lb generator. The generator is small enough to pass through a 6-in. opening and powerful enough to radiograph 1¼-in. thick steel in 45 seconds. Designed to be used by one man for on-the-job inspections, the unit is reported to be twice as powerful as conventional equipment of the same rating.

Capable of operation on almost any power line, the $2800 unit has a range of 50 to 140,000 v and 1 to 4 ma. Meters and stepless controls permit constant monitoring during each exposure.

Picker X-Ray Corp, 25 S Broadway White Plains, NY

MORE DATA? Circle 64, inside back cover



Side Transfer Attachment for Fork Trucks Said to Increase Storage Capacity up to 60%

An attachment which permits fork lift trucks to load and unload cargo sideways—without making the usual 90° turn—is reported to increase storage capacity up to 60% because aisles have to be only a few inches wider than the load.

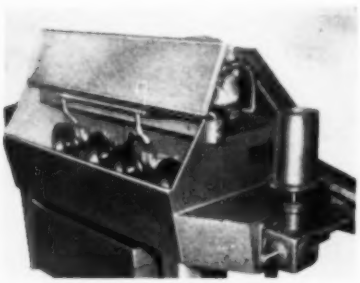
The device, called the STOW (side transfer optimum warehousing) system is adaptable to any modern standard counterbalanced fork truck, and handles pallets, skids, wire baskets, dies, and other materials. It can also be used to position loads between production machinery.

In one application, a 4000-lb capacity fork truck is used with a 2500-lb capacity STOW attachment, weighing less than 1500 lbs. For a 4000-lb payload an attachment with 4000-lb capacity must be matched with a 6000-lb capacity fork truck.

Storage racks are provided with special load bearing channels to carry the fork wheel, thus relieving the truck of undue stress and preventing any possibility of overturning.

Equipment Mfg Inc, 21550 Hoover Rd, Detroit 5, Mich

MORE DATA? Circle 65, inside back cover



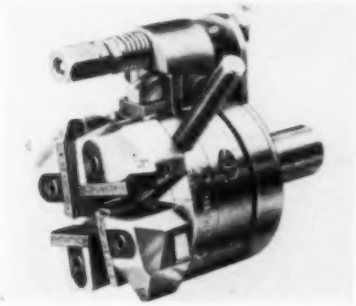
Four-Roll Tandem Wire Drawing Machine Offers Minimum Slippage

This four-roll tandem wire drawing machine has 6-step, 12-pass rolls, with major diameter of 12 in. The machined Meehanite rolls are designed and driven to minimize slippage of the wire due to elongation.

All-welded frame is made of ½ and ¾-in. steel plate. Main drive motor is available with 10 to 30 hp, 220 or 440 v, depending on size and speed of wire to be drawn. Motor can be geared or variable speed, with belt or chain drive.

R S Watkins and Sons, Inc, Glen Rd, Sandy Hook, Conn

MORE DATA? Circle 66, inside back cover



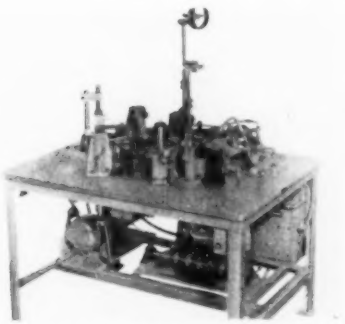
Push-Off Pull-Off Die Head Added to Landmatic Series

Combination die head series is available for Brown & Sharpe automatics, turret lathes, and other machines that use a stationary die head. Designated type DE Landmatic, new series replaces the EXX style which incorporated push-off action only.

Series is available in two sizes: the No. 4 (½ in.) with a No. 4 to ½-in. range for application to No. O, OG, 2, and 2 G B&S machines, and the No. 5 (⅝ in.) with a range of No. 4 to ⅝ in. for use on No. 2 and 2G B&S machines. Auxiliary equipment allows the No. 4 head to produce threads on diameters up to ¾ in. and the No. 5 up to 1 in.

Landis Machine Co, Waynesboro, Penna

MORE DATA? Circle 67, inside back cover



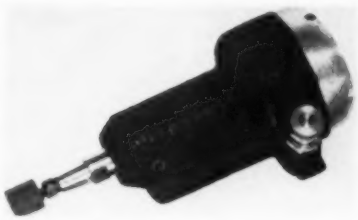
Cat Whisker Soldering Machine Automatically Feeds, Cuts, Shapes

New machine automatically feeds micro-miniature wire, only a few thousandths of an inch in diameter, from a spool into a tiny hole and solders it, then precision cuts the wire and forms it into an S shape. Unit has been production tested for the intricate operations involved in automatically soldering cat whisker wires into the prong of ceramic crystal diodes. Manufacturer states, however, that the principle of the machine may be applied to similar operations involving similar shapes or parts.

Model, currently designed for manual loading of the prong, can produce at rate of 800 per hr. Rate of output could be greatly surpassed by addition of an automatic loading device already designed by the company. Among features of the machine is precision indexing which permits the part or parts to be positioned so that the wire is bedded in the tiny receiving hole with unfailing accuracy.

Kahle Engineering Co, Union City, NJ

MORE DATA? Circle 68, inside back cover

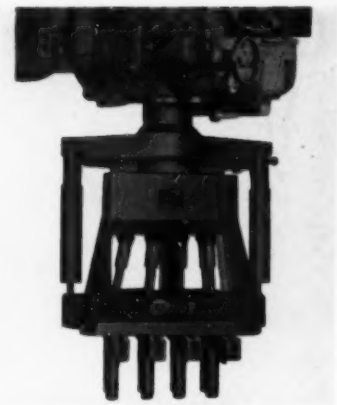


Air Powered Grinder Operates at 75,000 rpm

The Air Jet hand grinder Model 101 operates at a speed of 75,000 rpm and features a push button stop brake and speed regulator for rotary files and burrs. It requires an operating air pressure of 70 to 100 lbs, has a ⅛-in. chuck opening, and a maximum wheel diameter of ⅞ in.

M-F Engineering Co, 13828 S Western Ave, Blue Island, Ill

MORE DATA? Circle 69, inside back cover



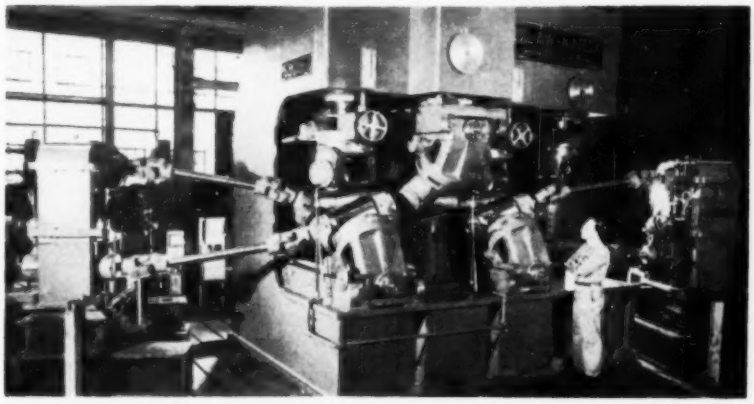
Attachment Adapts Multi-Spindle Drill Heads for Radial Drills

An air counterbalance and 360° ball-bearing swivel attachment are combined in a device to adapt large multiple-spindle drilling and tapping heads to radial drilling machines. It is said to be especially applicable for drilling structural steel, tube sheets, flue sheets, condenser sheets, and other cumbersome parts.

The two-cylinder air counterbalance, available in various strokes, handles the entire weight of the head and tools. The ball-bearing swivel allows the drill head spindles to be properly aligned with the pattern of holes required in the part, and is locked in position by a lever.

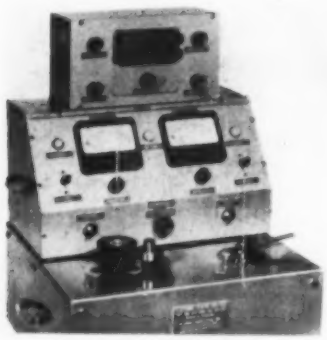
United States Drill Head Co, Cincinnati, Ohio

MORE DATA? Circle 70, inside back cover



LARGE DIAMETER THIN WALL STEEL TUBING is processed on this multicycle tube straightening machine equipped with four driven rolls for balanced turning torque around the workpiece. Unit has a cluster of three rolls (two driven) at input end; a twin roll bending stand engineered to keep pipe from ovaling at point of greatest load; another cluster of three rolls (two driven); and a single bending roll at the exit end. Pressure exerted by the two clusters is positively limited by a pneumatic pressure equalizing device. Model illustrated will handle tubing 3 in. to 9⅝ in. in dia—*Blaw-Knox Co, 300 Sixth Ave, Pittsburgh 22*

MORE DATA? Circle 71, inside back cover



Bearing Analyzer Identifies Both Visually and Audibly

Electronic Model BA-20, designed for analyzing the quality of anti-friction bearings, requires only 18 x 18 in. of bench space.

Rejection of a bearing is indicated by a red light. Complete check of balls or rollers, and all raceways is achieved in one-half to two minutes. User can set his own standards, or a standard rejection limit may be built into the instrument at the factory. Price is approx $1000.

Bearing Inspection, Inc, 3311 E Gage Ave, Huntington Park, Calif

MORE DATA? Circle 72, inside back cover

Weld Shaver Removes Beads, Flush-Finishes Surfaces

Portable unit incorporates a rotary cutter that removes excess filler and shaves weld beads to surface plane. Cutter is mounted between adjustable rollers which straddle and follow the weld bead on flat, convex, or concave surfaces. Finger-adjustable indexing ring permits operator to increase or decrease cutter depth in increments of 0.0005 in. Locking device fixes cutter position once the proper depth has been reached. Exhaust air blows chips away from the work surface and keeps the cutting head cool.

Model ZT508, recommended for use on stainless steel, steel, and titanium welds, operates at 3000 rpm, is 11½ in. long, weighs 9½ lbs. Model ZT509, designed for use on aluminum, copper, brass, and magnesium welds, operates at 11,500 rpm, is 9½ in. long, weighs 7½ lbs. Power is furnished in both models by a 1-hp air motor requiring 90-psi air supply.

Zephyr Mfg Co. 201 Hindry Ave, Inglewood, Calif

MORE DATA? Circle 73, inside back cover

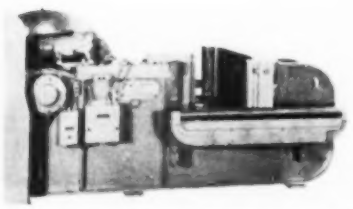
Resistance Soldering Tool Completely Eliminates Arcing

Resistance soldering tool eliminates tip arcing or flashing, provides even heating temperature throughout the work and produces void-free solder joints on critical connections in the aircraft and missile industry.

The tool is operated by an internal handswitch instead of footpedals and has a special zirconium-tungsten electrode that does not require frequent redressing. The transformer is rated at 400 amps with provision for two heats.

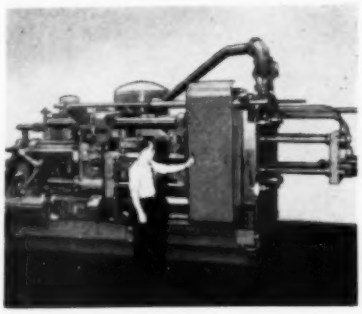
General Electric Co, Industrial Heating Dept, Schenectady 5, NY

MORE DATA? Circle 74, inside back cover



BENDING AND STRAIGHTENING MACHINE, Model 2, handles I-BEAMS up to 24-in. standard size, either horizontally or vertically. The 225-ton capacity machine has a 60-in. center, 12-in. adjustment on the slide, 1½-in. stroke, and operates at 28 strokes per minute—*Cleveland Punch and Shear Works Co, 3917 St Clair Ave, Cleveland 14, Ohio*

MORE DATA? Circle 75, inside back cover



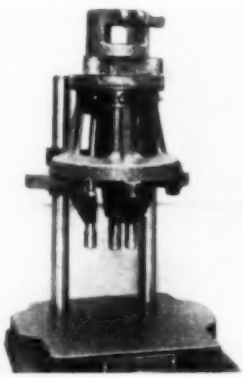
600-ton Die Caster Produces Aluminum Castings Up to 10 lbs

Model 600TDA for all types of cold chamber die casting has an adjustable die stroke of 12½ to 18½ in. Die plates measure 47 x 46½ in. giving 28½ x 28½ in. clearance between tiebars. Strain-gage tested die locking pressure is 600 tons.

Shot cylinder is provided with an adjustable slow start to allow complete venting of sleeve and runner system. In order to accommodate different length sleeves, the shot cylinder stroke is adjustable in a 6-in. range of initial phase of stroke, making complete stroke adjustable from 14 to 20 in. Hydraulic system employs three pumps.

Reed-Prentice Div, Package Machinery Co, East Longmeadow, Mass.

MORE DATA? Circle 76, inside back cover

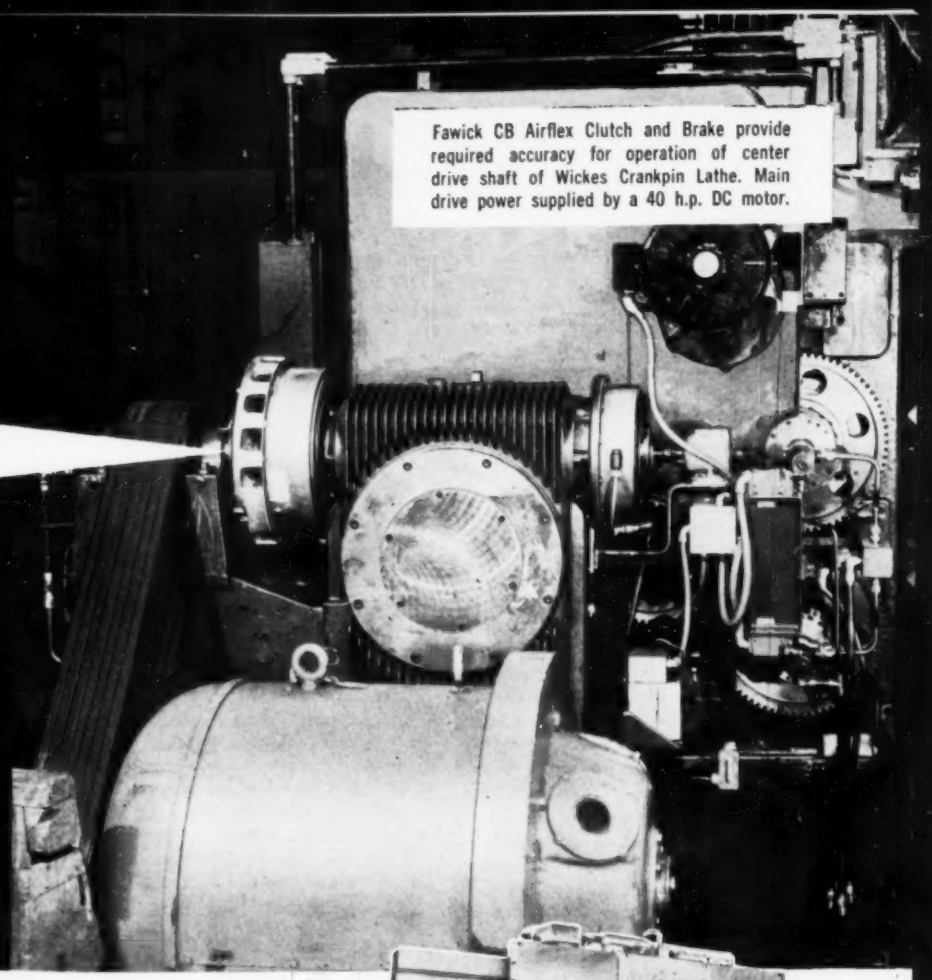


Drilling and Tapping Head Offered For Small, Delicate Operations

Model 400 Knuckle-Head, a fully adjustable 4-spindle unit, is designed to operate in any position on any drillpress, drilling or tapping unit, or machine. It will either drill or tap from 2 to 4 holes ranging from 1/32 to ¼ in. in steel.

Spindles are of the universal joint type and can be easily adjusted to almost any hole pattern within a 4-in.-dia bolt circle with a ⅝-in. min

Fawick Clutches here...



Fawick CB Airflex Clutch and Brake provide required accuracy for operation of center drive shaft of Wickes Crankpin Lathe. Main drive power supplied by a 40 h.p. DC motor.

help full automation HERE!

Automated machines require three basic characteristics in their operating components—and particularly in their clutches and brakes.

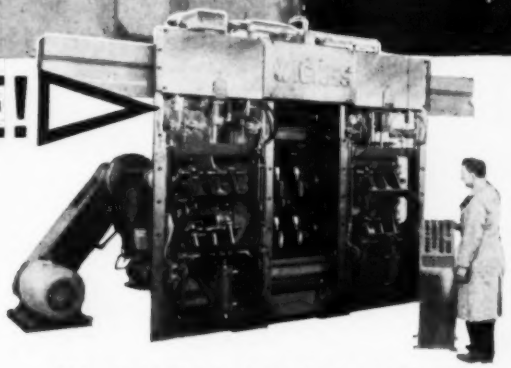
First, they must provide instant response to electric or electronic controls, with full-power torque output for all work done by the machine.

Second, they must produce shock-free precision starts and stops for accurate cycling of the machine and the work.

Third, they must provide long maintenance-free operating life with automatic adjustment for operating wear.

For these and other inherent advantages, FAWICK Airflex Clutches and Brakes are used on Wickes MX-4 Crankpin Lathes. This outstanding full-automatic multi-stage machine is used to turn crankpins, and to "cheek" counterweights to the shoulder diameter of crankpins—with both operations carried out simultaneously on two crankshafts.

FAWICK Airflex products can improve your machine performance. For full information on the advantages they offer call or write your nearest FAWICK representative or the Home Office, Cleveland, Ohio.



Wickes Model MX-4 Crankpin Lathe is used for automatic turning of crankpins, and "cheeking" of counterweights in simultaneous machining of two crankshafts.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
Fawick Canada, Ltd., 60 Front St., West, Toronto, Ont., Canada

FAWICK AIRFLEX

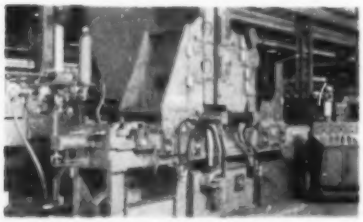
INDUSTRIAL CLUTCHES AND BRAKES

CIRCLE 249 READER SERVICE CARD

center distance. Special spindles allowing a ½-in. minimum center distance are available. Spindles are adjusted to the desired position by means of a locating arm which, like the spindle shaft, can be added or removed without tools. For fixed spindle operation, aluminum templets, jig bored as required, can be supplied instead of adjusting arms.

Ettco Tool & Machine Co, 594 Johnson Ave, Brooklyn 37, NY

MORE DATA? Circle 77, inside back cover



Flash-Butt Welder Joins Strip Stock End-to-End

This flash-butt welder, or skelp welder, is used for end-to-end fastening of flat wide strip stock in plating, pickling, stamping, or forming operations. Designated the Model BPW.3-400H, the machine makes a weld as strong as the parent metal and also shears off flash particles to maintain a continuously flush surface.

It will handle hot-rolled low carbon steel from 0.060 to 0.20 in. thick and 12 to 22 in. wide, or a capacity of 4.5 sq in. cross sectional area of mild steel and 2.6 sq in. of stainless steel. Upset force is 90,000 lbs max; clamping force is 135,000 lbs max; platen opening is 8 in. max. Transformer is rated at 400 kva at 50% duty cycle.

Sciaky Bros, Inc, 4915 W 67th St, Chicago 38, Ill

MORE DATA? Circle 78, inside back cover

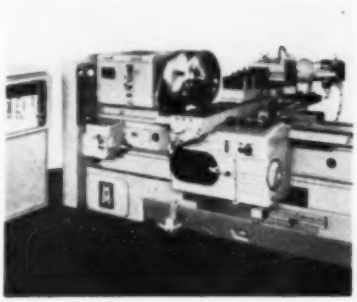
Seam Weld Fixture Incorporates Twin Mandrels for Double Setup

Weld seaming fixture with opposed holding and clamping mandrels is designed to attain continuous arc time and maximum operational utility of one automatic welding head and power source.

While welding cycle is taking place on one end of the fixture, the next piece to be welded is being loaded in the opposite end. Normal downtime for loading and unloading is minimized by continuing the weld immediately to the next piece to be processed.

Pandjiris Weldment Co, 5151 Northrup Ave, St Louis 10, Mo

MORE DATA? Circle 79, inside back cover



German Lathe Features Pre-Set Automatic Control System

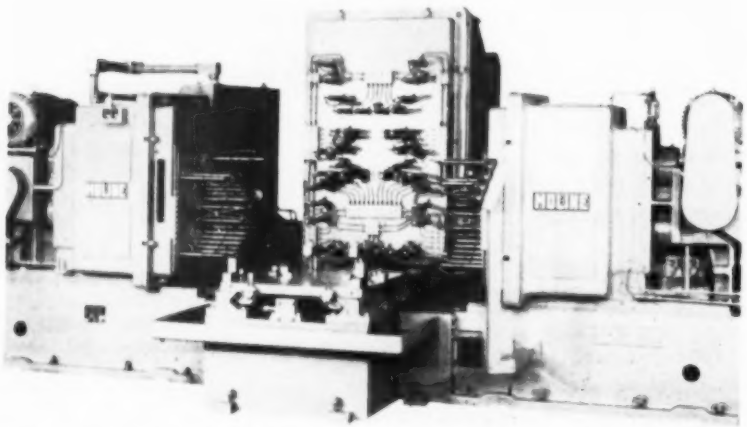
This Max Mueller (German) production lathe features a pre-set universal program control called Eltropilot that provides completely automatic machining of all kinds of workpieces.

Key components of the Eltropilot system are a plug panel for accepting and issuing orders, a prepared punch-card to indicate correct placement of plugs in panel sockets, and interchangeable trip dogs set in cam plates according to desired dimensions. Control orders from the panel are determined by the location of the plugs. Impulses transmitted from the plugged panel socket lines actuate relays which carry out the orders.

The Eltropilot can store 60 commands and control 20 operations, with combinations of 20 commands for any operation. Short runs are said to be as economical as long ones. This system will control all machines having electric motors, electro-magnetic clutches, hydro-magnetic valves, and similar remotely controllable units.

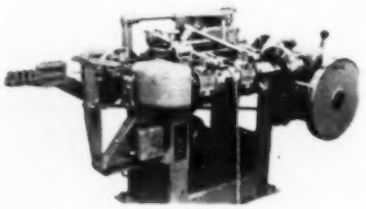
Imported by Cosa Corp, 405 Lexington Ave, NY 17, NY

MORE DATA? Circle 81, inside back cover



NINETY-THREE HOLES AT A TIME are tapped in two sides and rear of a tractor transmission case by this Model HHU85 three-way horizontal machine, using ⅜-in.-16 and ½-in.-13 taps. Each 23-spindle left and right-hand unit covers a working area of 18 by 32 in. Rear unit covers a working area of 30 by 54 in. and carries 47 spindles—*Moline Tool Co, 102 20th St, Moline, Ill*

MORE DATA? Circle 80, inside back cover



4-Slide Forming Machine Has Built-In Press Section

Compact Model S-1-F, now mounted on a welded steel pedestal base for max strength and rigidity, has variable speed motor drive positioned directly in back of the machine instead of on the end. Floor space required is 53 in. x 57 in., a reduction of more

NEW

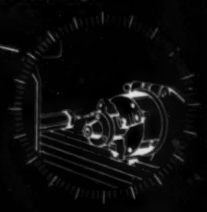
ERICKSON

MASTER SPACER

with No. 0 Timken Bearings

gives increased production and optimum accuracy in

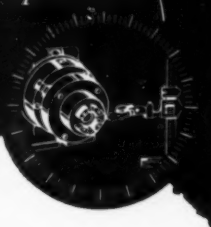
straddle milling



milling

jig drilling
with either micrometer or "Jo" block setting

inspection



Write for free catalog "Erickson Master Spacer" today. And at the same time request your copy of Catalog K; you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

The new Erickson Master Spacer, ideal for tool room and production machining, assures outstanding performance under heavy helical cuts and slow feeds. *Indexing accuracy guaranteed within .001-inch cumulative error on a 6-inch diameter circle.* Jig drilling is possible with either micrometer or "Jo" block setting. Timken bearing construction permits work to be trued in position with brake off because spindle alignment remains unchanged.

The new Erickson Master Spacer can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

AA 3091

ERICKSON TOOL COMPANY

34459-5 Solon Road • Solon, Ohio

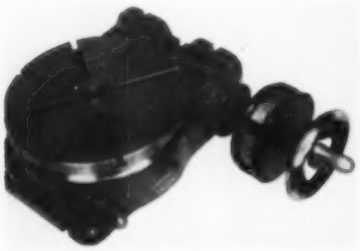
COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

than 1000 sq in. compared to the previous model. Other new features include double gibs, Twin-disc clutch, and redesigned gear guards.

Unit, designed primarily to stamp and form ribbon metal in one operation, will also form wire with a max feed length of 8 in. It can handle wire up to 3/32 in. in dia, and ribbon metal up to 1¼ in. wide. Built-in press section has a ¾-in. stroke and max pressure capacity of 8 tons. A 2-hp motor drive permits speed ranges from 57 to 200 spm.

A H Nilson Machine Co, 600 Bridgeport Ave, Shelton, Conn

MORE DATA? Circle 82, inside back cover



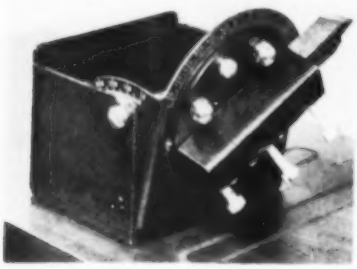
Rotary Table Reads to 1 Sec, Has ±2 Sec Accuracy Over 360°

Model No. 2 11-in. rotary table reads to 1 sec and has an overall performance accuracy of ±2 sec throughout the entire 360°. To achieve this accuracy it uses a non-disengageable, thread-ground worm in combination with the accurately spaced teeth of its mating gear.

The table top is parallel to the base within 0.0001 in. and the fine center bushing hole runs true to 0.00015 in. tir.

Moore Special Tool Co, Inc, Bridgeport, Conn

MORE DATA? Circle 83, inside back cover



Toolbit Grinding Fixture Offered at Low Cost

Toolbit grinding fixture for use on surface grinders sells for $16.50 and is made of pressed steel with precision ground master surfaces. It sets up quickly for any combination of rake and clearance angles, grinds all sides in one setting, holds any single point tool, and has compound angle markings stamped into each tool.

Overall size is 3 by 3 by 3 in. Toolbit capacity is ¼ by 2¼ in., with special sizes for tool bits up to 2½ in.

Montgomery and Co, Inc, 401 Morris Ave, Springfield, NJ

MORE DATA? Circle 84, inside back cover

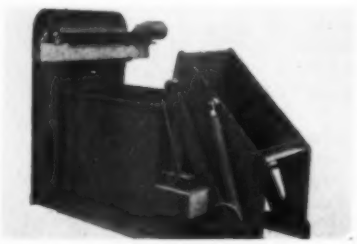
General Purpose Furnace Has Fast Cycling, Close Temp Control

General purpose furnace for tempering and drawing jobs reaches the desired temperature in a matter of minutes and maintains its temperature to ±5 F during the treatment cycle.

Maximum temperature of the Type D Flexotemp furnace is 1250 F. Models are available with work baskets from 22 to 36 in. dia and from 30 to 48 in. deep.

C I Hayes, Inc, 810 Wellington Ave, Cranston 10, RI

MORE DATA? Circle 85, inside back cover



High-Speed Hopper Feeder Has Powered Out-Feed

Unit combines a continuous operating vane-type elevator, aligning and conveying cylindrical stock from hopper, with a powered out-feed mechanism that is capable of conveying parts up to 20 ft from feeder escapement to operating machine. Adjustable feed speed with safety slip clutch eliminates possibility of over feeding of parts. All length and diameter parts within the feeder range can be handled without adjustment.

Up to 7000 average length cylindrical pieces per hour can be fed by regular models into centerless grinders, automatic lathes, dial feed presses, forming machines or assembly devices. These models take parts from ⅜ to 3 in. in. dia by 1 to 6 in. in length. Larger size units are available for feeding stock length bars, rods, and tubes of ½ to 4 in. in dia by 10 to 21 ft stock length.

Clark Industries, PO Box 314, Delaware, Ohio

MORE DATA? Circle 86, inside back cover

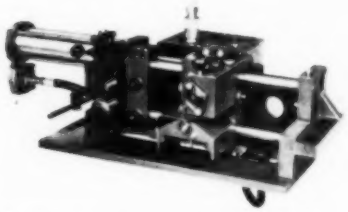
Improved Bandsaw Blade Welder Welds up to ¾-in. Blade Widths

Designed for manufacturing operations that require large quantities of bandsaw blades, unit will cut and weld any length of blade.

Model has a factory-set flash adjustment, improved jaw clamping adjustment, tension adjustment, and blade width indicator. Additional features include a blade shear and a grinding wheel for removing flash. Brackets can be furnished so that the welder can be directly mounted to Delta and Walker-Turner bandsaws. Unit is priced at $208.

Rockwell Mfg Co, Power Tool Div, 454 N Lexington Ave, Pittsburgh 8, Penna

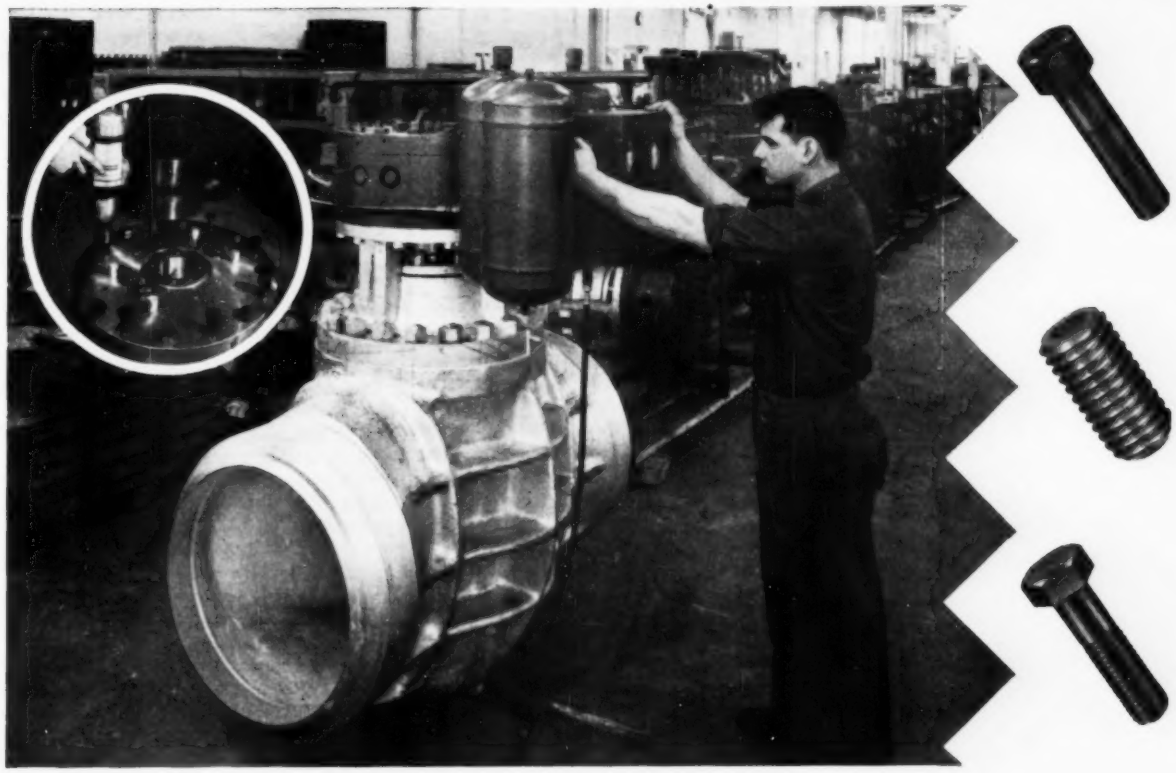
MORE DATA? Circle 87, inside back cover



Self-Locking Inserts Secure Press Feeder Against Vibration

Air operated slide feeders, designed to be mounted directly on a shear, brake, or press, have self-locking

IT PAYS TO STANDARDIZE ON **STANSCREW**



Stanscrew service adds strength, lowers costs for Shafer Valve Company

The valve operators produced by Shafer Valve Company of Mansfield, Ohio are used to open and close large valves on gas pipe lines . . . often in remote locations, many miles from human supervision. They are subject to sudden surge loads which cause extremely high stresses . . . and their critical importance demands unfailing reliability of all components.

Shafer formerly manufactured their own fasteners for this demanding application from a special high strength steel. Then their distributor arranged for a visit from Stanscrew's fastener specialist. He quickly established that Stanscrew's heat-treated "Carbon Restoration" cap screws, correctly applied, could provide even greater fastener strength . . . and at a significant saving in cost.

The Stanscrew fastener specialist may be able to make similar savings or improvements in your assembly operations. For he brings to your application the experience and facilities which have made Stanscrew a leading supplier of fasteners to the top names in American industry for over 80 years. And he can select money-saving answers to your problems from a complete line of over 5,000 different types and sizes of standard fasteners . . . always in stock, quickly available.

Whatever your fastener requirements, call your nearby Stanscrew distributor today. He will arrange for a prompt visit from the Stanscrew fastener specialist.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

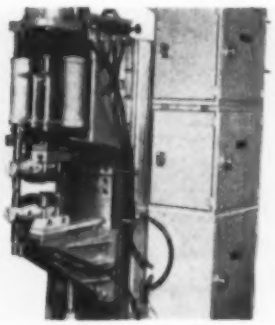
stainless steel wire thread inserts in all tapped holes to prevent the assembly from being loosened by continuous impact and vibration.

Feeder consists of a feed block with a self-contained hydraulic cushion, a three-way shut off valve, and an air powered motor. It will feed coil stock, wire and regular cross-section materials to an accuracy of 0.002 in. per stroke.

The feeders are made in sizes ranging from a 6-in. feed that will operate at 135-150 strokes per minute to a 24-in. feed operating at 50-60 strokes per minute.

Cooper-Weymouth Inc, Stratford, Conn

MORE DATA? Circle 88, inside back cover



Resistance Welders Feature Lineal Ball Bearing Sleeves

Line of single phase resistance welders claims many design improvements, principally a lineal ball bearing sleeve which is said to provide friction-free operation of the welding head, ability to withstand the heaviest pressures, non-binding and non-inhibited ram performance, instant follow-up in controlling weld properties, and elimination of the need to replace or regrind the ram.

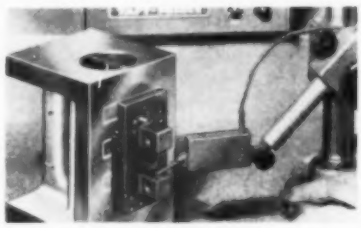
Other features include aluminum rams, neoprene cylinder rings, and pull-in rams on horizontal models.

According to the company, the welders are designed to provide high production performance for up to 25 years or more without requiring major repairs.

New models being offered are: single and double-ram press-type spot and projection welders with 5 to 250 kva capacities; fully and semi-automatic butt welders with 5 to 100 kva capacities; press-type bench welders with 5 to 50 kva capacities; rocker-arm spot welders with 10 to 75 kva capacities.

Electro-Weld Div, Electro Arc Inc, 152-1 Jelliff Ave, Newark 8, NJ

MORE DATA? Circle 89, inside back cover



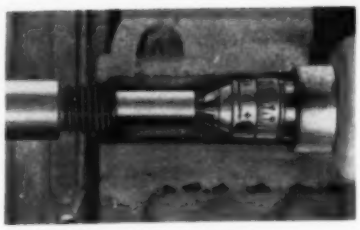
New Magnetic Angle Iron Speeds Layout and Inspection

Model 9195 combines the advantages of a universal right angle iron with a magnetic chuck. Magnetic faceplate can be energized by a 90° turn of a recessed control bar, one of which is located on each end face. By turning the bar 25° a special fringe magnetic setting is produced that allows the work to be easily adjusted by hand to the final location before full holding power is applied by a complete 90° turn. Work is held firmly in place for measuring, scribing, or indicating.

Device, which can be turned on its side, back, or ends for checking work in different postions with reference to a surface plate, is 4¾ in. long, 4¼ in. wide, 6½ in. high, weighs approximately 18 lbs.

Taft-Peirce Mfg Co, Woonsocket, RI

MORE DATA? Circle 90, inside back cover



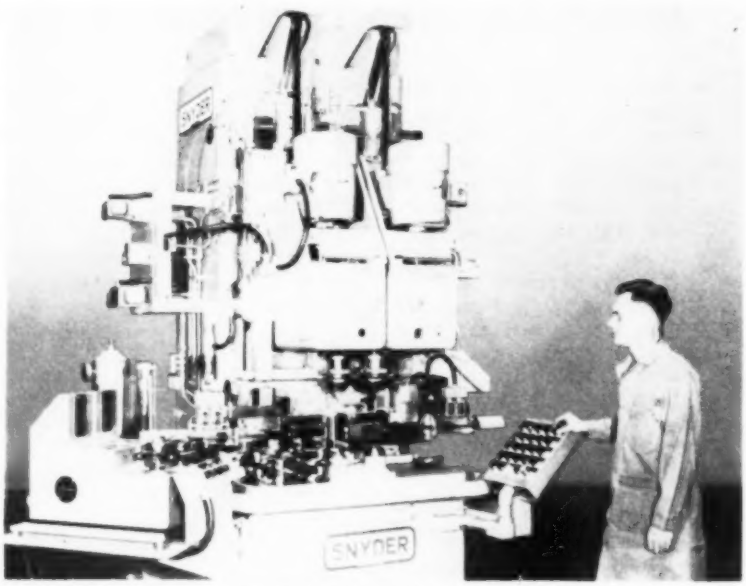
Adjustable Center Speeds Center Alignment on Lathes

The Micro Set adjustable center is said to eliminate the tailstock jogging usually required when doing precision or taper turning. According to the manufacturer, a lathe operator using the device can make precise headstock-tailstock alignment in half the time of the conventional method.

Corrective movement of the work held between the lathe headstock and the adjustable center is made by an equally eccentric ground sleeve and arbor, which when assembled complement each other and produce lateral movement of the ground and hardened tip in increments of 0.001 in. Total tip movement in either direction is 0.006 in.

Enco Mfg Co, 5420 W Fullerton Ave, Chicago, Ill

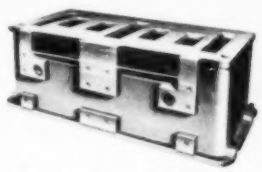
MORE DATA? Circle 91, inside back cover



FORGED STEEL CONNECTING RODS are balanced-milled at a rate of 102 pieces per hour on this two-spindle milling machine. The electrically controlled, hydraulically operated machine hollow mills both crank and pin end on each side of the rods—*Snyder Corp, 400 E Lafayette Ave, Detroit 7, Mich*

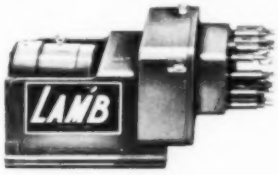
MORE DATA? Circle 92, inside back cover

CIRCLE 252 READER SERVICE CARD ►

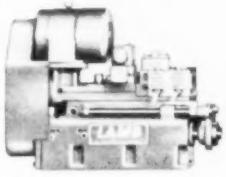


Double Wing Main Base

Single Wing Main Base



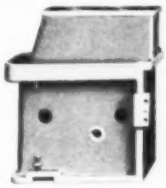
Way Type
Drilling Unit



Quill Type Drilling
Unit—Hydraulic

Way Type Wing Base
18" Travel

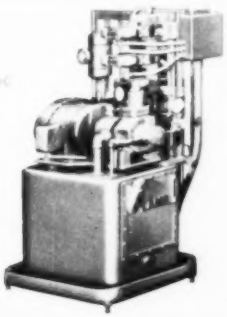
Wing Base
Quill Unit



Way Type Wing Base
24" Travel

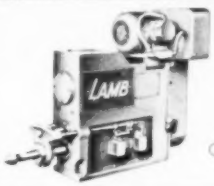
Angular Base
Quill Unit

Hydraulic
Power
Unit



Vertical
Column

Wing Base Adapter
(Radial)



Quill Type
Drilling Unit
Cam Operated

STANDARD

"Building Block"

COMPONENTS

for

SPECIAL

TRANSFER MACHINES

Lower Initial Cost

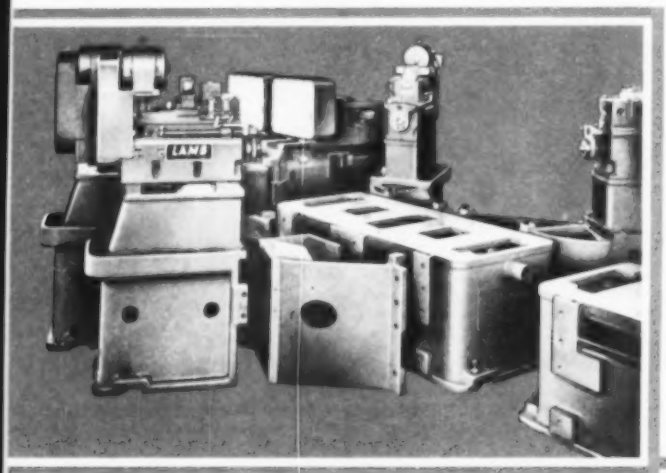
Lower Change-Over Cost

Greater Production Economy

Shorter Lead Time

Reusable Components

The LAMB Emblem of Excellence

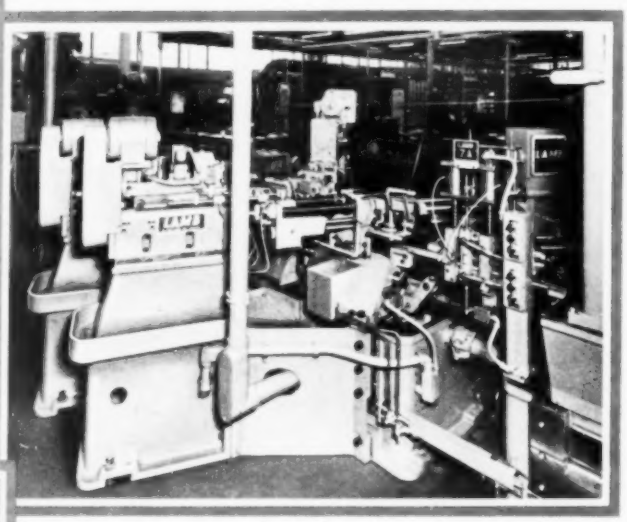


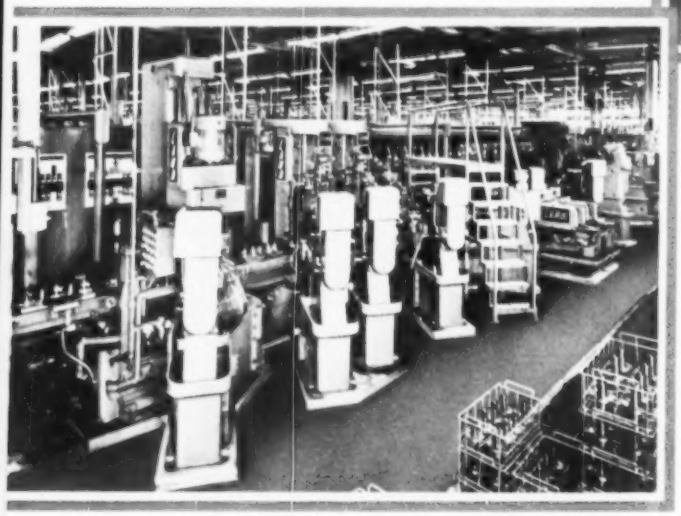
Standard Components Ready for Assembly

Experience has proved that the infinite number of combinations possible with Lamb standard components will satisfy practically all machining requirements. The standard components are manufactured in quantities which means substantial savings in cost and in machine delivery time. These components are designed also to provide ease of assembly and maximum interchangeability . . . resulting in important savings because they are not obsoleted by production changeover. For example, all main base mounting pads are machined although they are not all used . . . this means greater economy later should additional wing units be required for added operations.

The Completed Machine

Complete understanding of the customer's problems is one reason why the completed machine has received the customer's enthusiastic acceptance. Production economy is assured by Lamb's knowledge of high-production methods. Accuracy and reliability in parts movement, location, and metal cutting add to the assurance of high quality parts at low cost per piece.





Easy Accessibility

Here is the Lamb machine installed in the customer's plant. It occupies a minimum of floor space yet provides adequate accessibility for quick tool change, adjustments and servicing. The machine configuration itself is thus a production convenience that promotes good housekeeping and overall efficiency. Tested and proved metalworking techniques are supplemented by Lamb's engineering initiative to overcome specific and critical problems.

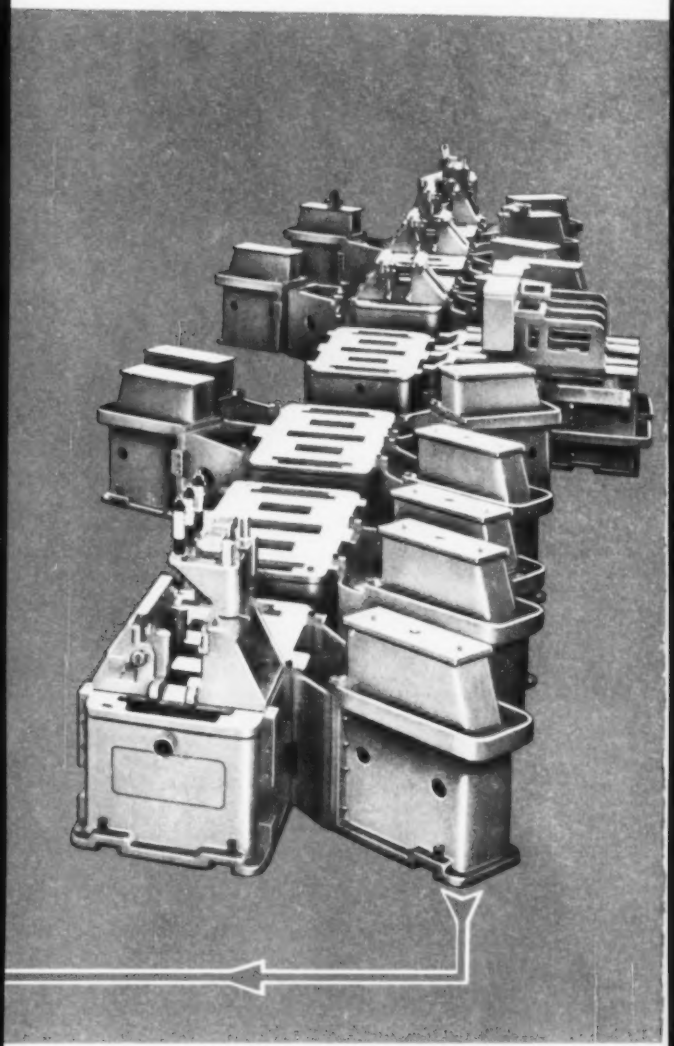
Submit ***Your Part or Part Prints For Analysis and Suggestions***

LAMB *Standard*

"BUILDING BLOCK" COMPONENTS

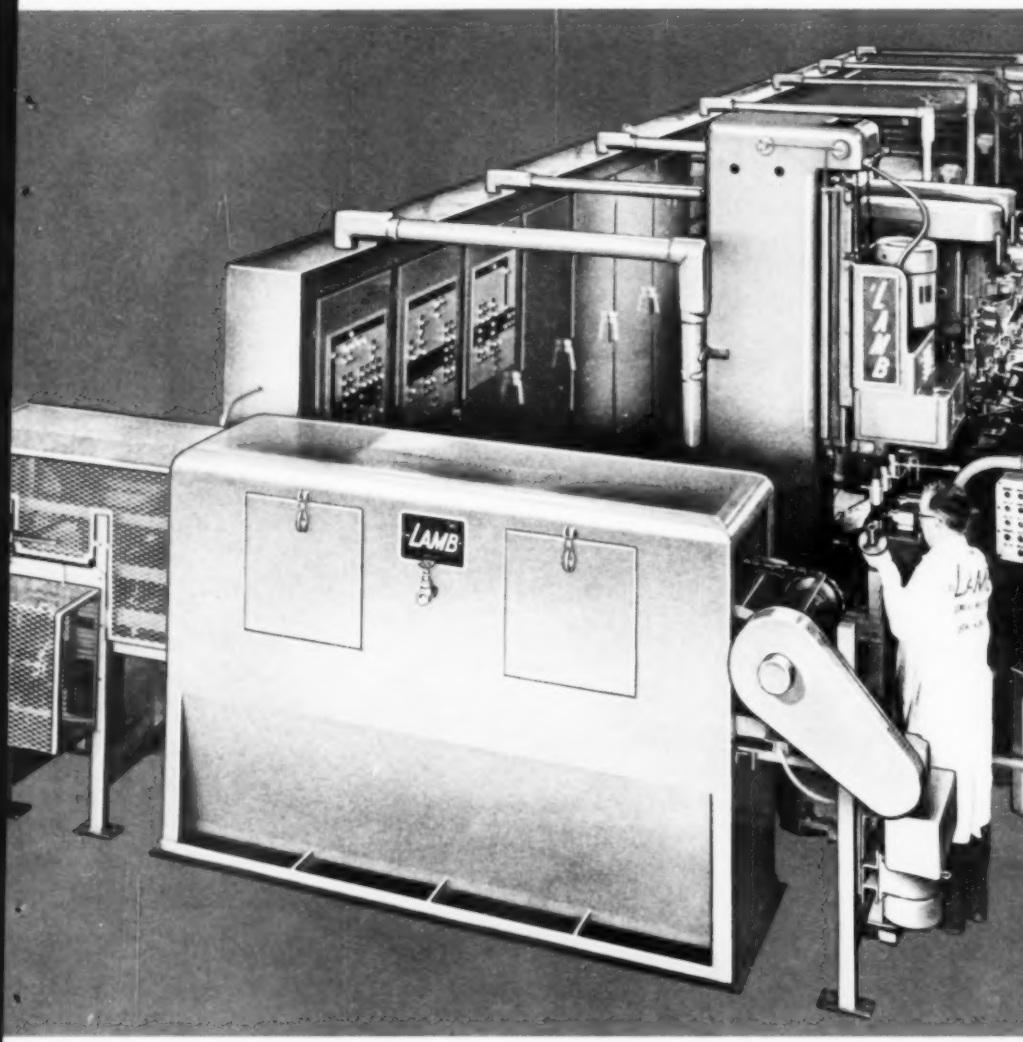
In Early Stages of

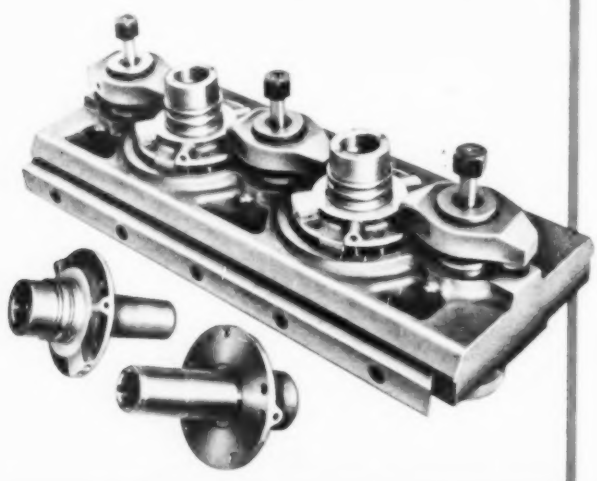
TRANSFER MACHINE ASSEMBLY



The Lamb "building block" principle is clearly illustrated here. The main base of the transfer machine is a series of standard sections each with integral chip chutes and recesses for readily accessible piping and electrical conduit. These sections support the fixtures and accessories; they have accurately machined mounting faces for attaching wing and column base units which are the working stations. This use of standard components represents the fulfillment of industry's demand for versatility and flexibility in processing equipment.

on Another Transfer Machi





334 Stator Supports

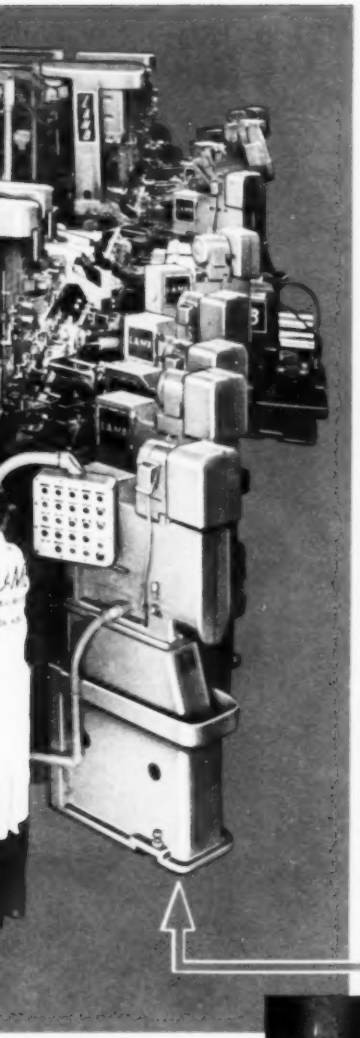
from this LAM

Palletized Transfer

Processing includes almost
method of machining holes. T
carried in pallets (left) which a
station-to-station by a walkin
mechanism. Pallet clamping is
Each station is equipped wit
pins, and machining thrust is
pallet guide rails installed
tolerance with the pallet runn

Stator supports are machined
ferent angles and the pallet is
only twice to gain access to t
the parts.

hine



orts Per Hour

LAMB

sfer Machine

nost every known
oles. The parts are
hich are transferred
walking beam type
ping is not required.
ed with registering
rust is against the
alled to precision
runners.

hined from six dif-
allet is repositioned
s to the bottom of

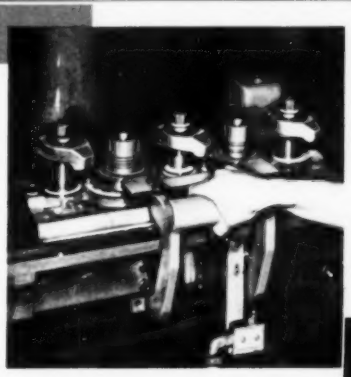
HIGH PRODUCTION EFFICIENCY IS ASSURED . . . *because of* *LAMB'S Knowledge of Manufacturing Methods*

Well designed basic components combined with creative engineering are the ingredients found in every Lamb machine. Built-in production aids minimize the customer's in-plant problems and improve overall operating efficiency.

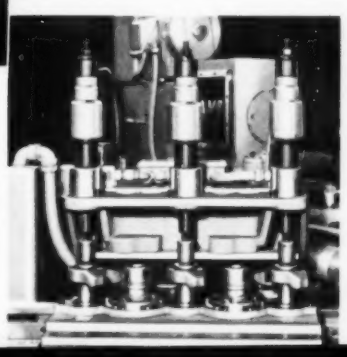
Listed below are some of the features included in the Stator Support Machine. They are indicative of the long experience, thorough planning and complete attention that Lamb engineers apply to every detail.

- Probing of all holes before reaming.
- Controlled acceleration and deceleration of transfer index and raise mechanism.
- Complete manifolding of hydraulic accessories to minimize piping and possibility of leakage . . . also for greater accessibility and faster servicing.
- Centralized automatic lubrication system; oil bath in self-contained units.
- Master electrical push button control at load station . . . pivots for right or left side operator position.
- Individual control buttons at all working units.
- Schematic light control panel indicates each station function or malfunction.
- Automatic clamp and unclamp of parts in pallets.
- Automatic pallet return and washer system.

From Loading to Unloading LAMB *provides* Production Convenience

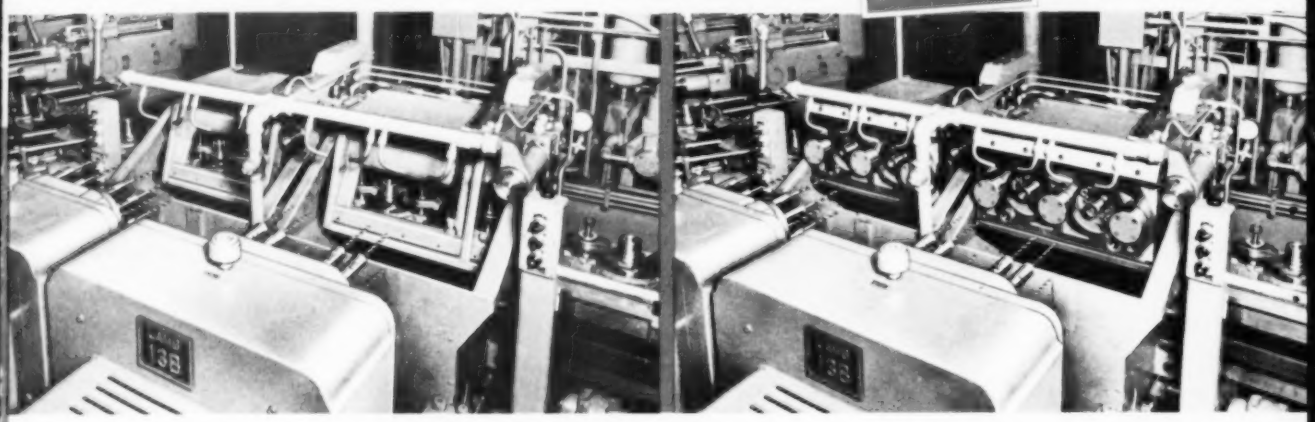


Rough positioning device (left) at the operator's station assures accurate radial location of parts in pallet for positive automatic clamping. Handle trips a limit switch that otherwise prevents machine operation.



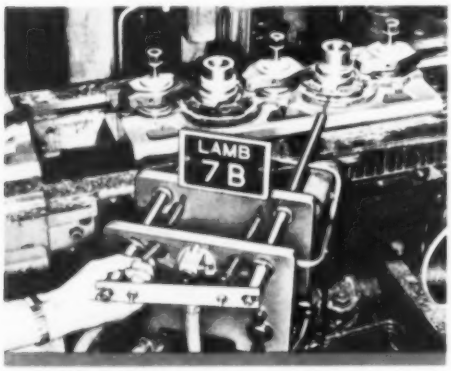
Automatic nut runners (right) speed unclamping of parts in pallet. Clamp dogs turn out of the way for easy part removal.

CREATIVE ENGINEERING ***Identifies a*** LAMB *MACHINE*



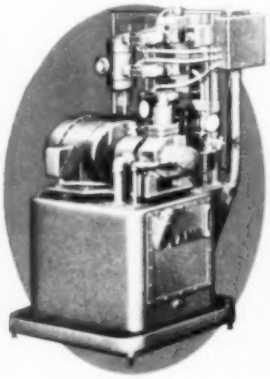
Pallet and Parts Repositioning at Work Station

To perform operations on the bottom of the parts, the entire pallet is rotated 90 degrees to present its bottom surface to the tools. With bushings inserted into the bottom of the pallet, it becomes a drill jig fixture. This technique eliminates subsequent handling to gain access to the bottom surface of the parts.



Probes Replaced in Seconds

A light spring-loaded bar holds probes in their bushings against a spacer plate. Only one limit switch is required with this arrangement which permits single or multiple hole probing.



"Packaged" Hydraulics

Hydraulic power units are built to JIC Standards using nationally accepted components selected for service familiarity of maintenance personnel and replacement parts inventory economies.

Lamb Pallet Washer

Pallet handling and washing is completely automatic. Unloaded pallets are automatically transferred to a conveyor and returned to the load station after being washed; they are in position for loading and indexing into the machine.

A completely equipped modern facility staffed by men who design and build the finest in special and transfer type machines and automatic parts handling equipment.

8191

F. JOS. **LAMB** CO. SINCE 1914

5663 E. NINE MILE ROAD • DETROIT 34, MICHIGAN

Engineers and Builders of Special Machines and Automation Equipment

LITHO IN U. S. A.

Just as a matter of machining economy—
Why don't you investigate

CARMET INDEXABLE INSERTS
AND TOOLHOLDERS

Cost to regrind single point tool	*50¢ to 1.50*
Cost to regrind Carmet Indexable Inserts	*NOTHING*
Cost of 800 brazed single point tools at approx. $3.50	*$2,800.00*
Cost of 100 square Carmet Indexable Inserts with 800 cutting edges, approx.	*$100.00*

Plus **savings in higher production, longer tool life, tool storage, tool inventory, less tool-change downtime**

Over 9 styles and 109 sizes in Carmet cadmium plated tool holders. 6 carbide grades for machining almost all material from wood and plastics to high alloy steels.

WSW 7324 A

Write for new Catalog C-16

CARMET CEMENTED CARBIDES FOR INDUSTRY

This 32-page first edition contains prices and complete specifications on Carmet's full line of cemented carbide tipped tools, blanks and holders. Speed and feed charts, grade comparisons and ordering information included.

ADDRESS DEPT. AM-17

See your Carmet Distributor now or write
Carmet Division, Allegheny Ludlum, Detroit 20, Michigan

CARMET

CEMENTED CARBIDE DIVISION OF
ALLEGHENY LUDLUM STEEL CORPORATION

◄ CIRCLE 257 READER SERVICE CARD

CIRCLE 258 READER SERVICE CARD

Abrasive Belt Swing Grinder Introduced in Small, Light Model

Model 712 for contact roll grinding and slack-belt polishing develops 5 hp in constant service on a 2½-in.-wide by 72-in.-long abrasive belt. Unit weighs 150 lbs with motor, is 46 in. long, 23 in. wide, 14 in. high.

Abrasive belt operates over a motor-mounted drive roll, belt tension roll, and a rubber-covered serrated contact roll. Belts are quickly changed by moving a lever, once to release tension and once to apply it. Motors are 220/440 v, 60 c, 3 phase, totally enclosed, fan cooled, ball bearing. Frames are standard NEMA; equivalent standard motors may be substituted. Motor choice: 2 hp, service factor: 1.2; 3 hp, 1.4, 5 hp, 1.0.

Ryman Engineering Co, 523 Spring Ave, Ellwood City, Penna

MORE DATA? Circle 93, inside back cover

Power Quills Have Speed Range of 20,000-45,000 rpm

Three power quills, with speed ranges of 20,000 to 45,000 rpm, permit work tolerances of 0.0001 in. on all types of metals as well as plastics, wood, and glass.

Models Super 55 and 55D, with 1/3-hp motor, are reported to provide low cost precision machining for production milling small parts, accurate grinding and carbide micro milling of hard or abrasive materials. Model 55 uses S collets with 316 in. maximum capacity. Model 55D is equipped with a precision drill chuck having a range of 0 to 0.157 in. Model Super 65 has a ½-hp motor and uses type P collets with a capacity of ¼ in.

Precise Products Corp, Racine, Wis

MORE DATA? Circle 94, inside back cover

Boice-Crane to Market Swedish Drill Presses

A line of medium capacity Swedish drill presses, including 1 in. and 1¼ in. capacity hand feed models in the 18 and 24-in. classes and a power feed model in the 24-in. class, will be marketed by Boice-Crane in the US.

All presses are equipped with gear drive. Drills have automatic depth stops to provide up to three stops for hand feed drilling and interrupted stroke drilling and counterboring. A hand switch is available to reverse direction for tapping.

Boice-Crane Co, 935 W Central Ave, Toledo 6, Ohio

MORE DATA? Circle 95, inside back cover

Direct Chilled Aluminum Tooling Plate Has High Density, Stability

Aluminum tooling plate, designated 921-T-DC, is direct chilled during casting to achieve fine-grain, uniform molecular structure, with greatly improved stability, mechanical properties, and machinability.

According to the manufacturer, the ease of fabrication may cut labor costs as much as 40% and the 32 micro-inch surface finish usually makes additional machining unnecessary.

The plate is made in sizes up to 60 by 192 in., from ¼ to 24 in. thick. Standard thickness tolerance is ±0.010, and standard flatness tolerance for thickness ¾ in. or more is ±0.005.

Alloy 921-T-DC is non-sparking and can be welded with standard welding practices. It is easily sawed, tapped, and milled, and allows speeds up to 6000 fpm in turning, milling, and drilling.

Pioneer Aluminum Inc, 5251 West Imperial Hwy, Los Angeles 45, Calif

MORE DATA? Circle 96, inside back cover

Oliver Adds Heavy-Duty Model To Its No. 21 Drill Pointer Line

Heavier-duty model permits extension of drill size range for the Oliver point which, until now, has been available only on the No. 510 drill pointer which has a max capacity of 3 in. dia. Drill grinding technique permits a more intensive clearance angle on the point as the drill web is approached.

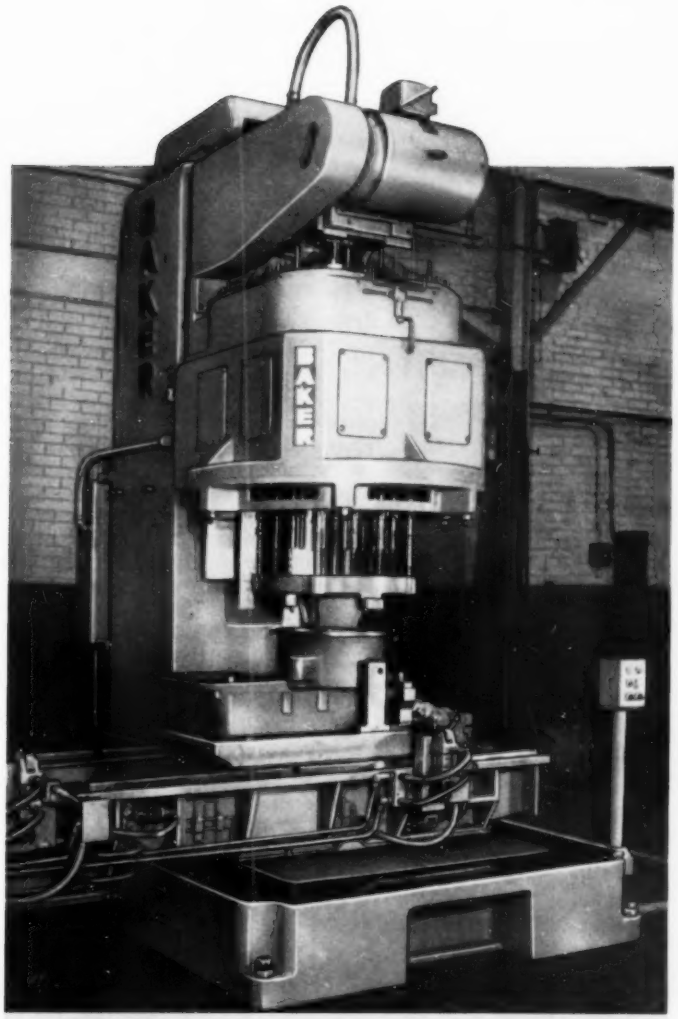
While basically the same as its standard companion, the new model makes use of ball bearings in conjunction with a special cam-operated stud. This controls horizontal motion as the drill moves across the grinding wheel face to produce the desired point. Capacity of the new machine is the same as the standard model, 3/32 to ½ in. Standard equipment includes a ¼-hp motor, grinding wheel, diamond dresser, jaw assemblies, and setting gage.

Company will sharpen drills on a no-charge trial basis to demonstrate the capabilities of this machine.

Oliver Instrument Co, 1448 E Maumee St, Adrian, Mich

MORE DATA? Circle 97, inside back cover

A special machine job done by a STANDARD BAKER®



Baker A-24-VU Adjustable Spindle Machine with standard 36" round universal head and standard slip plate bored for 46 spindles.

ADJUSTABLE SPINDLE MACHINE

An automotive contractor's production did not allow for a special machine to work on heavy, hard-to-handle truck transmission housings. Conscious also of retooling costs, the contractor took his problem to the BAKER engineers.

THE RESULT: This A-24-VU Standard Adjustable Spindle Machine, with a few special adaptations. Only accessories added: slip plate, bushing plate and transfer, including pallet.

The work piece is held on a pallet which transfers it from prior operations where the top flange of the housing is completely machined. The BAKER drills 2 sets of bolt circle holes on the top flange and 1 set at the housing bottom. A bushing plate, supported on the slip spindle plate, guides the drills and targets into bushings on the pallet for positive location.

Using this BAKER Standard, the contractor saved special machine costs, gained the high production needed and found it simple to take the BAKER out of the transfer line and use it for other drilling and tapping operations.

For the complete story on how Baker Standard Adjustable Spindle Machines can solve your special production problems, write Baker Brothers, Inc., 1000 Post Street, Dept. AH-559, Toledo 10, Ohio.

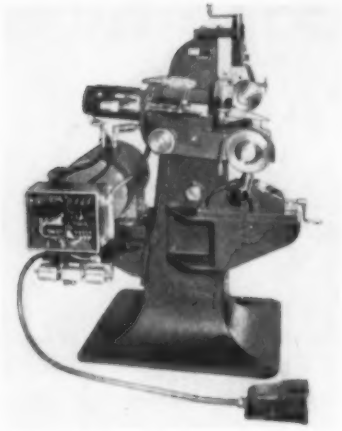
THIS IS REAL Flexibility

NOW...COMPLETELY INTERCHANGEABLE

TO FIT 3 SIZES VERTICAL MACHINES		TO FIT 3 SIZES HORIZONTAL MACHINES
	21 ADJUSTABLE-SPINDLE HEADS 27 FIXED-SPINDLE HEADS 3 TYPES STANDARD TABLES	

BAKER®

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES



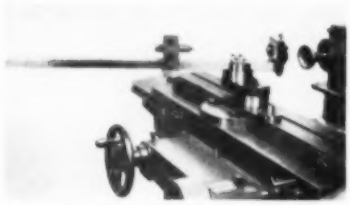
Pipe and Tube Cutoff Machines Have New Hydraulic Power Check

New models are designed for faster wheel approach to the work, precision control of cutting even on thin-wall, large OD tubing, and a fast return of the wheel to normal position. Machines are designed with JIC electronic and hydraulic components.

Hydraulic power check achieves a smooth cutting stroke by keeping the exact uniformly-regulated cutting pressure on the wheel and work. Erratic feed, present in pneumatic systems, is completely eliminated, according to manufacturer. Machines cut pipes and tubes from ⅜ to 12¾-in. wall thicknesses.

Continental Machine Co, 2345 W Nelson St, Chicago 18, Ill

MORE DATA? Circle 98, inside back cover



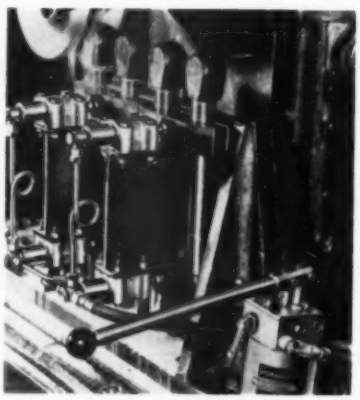
Multi-Purpose Fixture Sharpens Gun Drills and Reamers

Fixture for sharpening single and multiple-flute gun drills, gun-type reamers, and conventional reamers, is designed for mounting on a conventional tool grinder. Operator can quickly and accurately position the tool for sharpening of compound-angle surfaces by swinging the fixture to a vernier angle setting and positioning a flute stop by a vernier-located setup gage.

During the grinding operation, drill or reamer is supported at the front end by a ground bushing and at the rear by a center. Once correct angle setting and flute stop position is made, operator inserts the tool in the bushing, rotates it against the flute stop, and brings up the rear center to support the tool. Tool is rotated by hand as it is passed by the wheel to sharpen one of the faces. Six different setup gages and bushing clamps for ½, ¾, 1, 1⅜, 1¾, and 2¼-in. OD bushings are provided. Three different tail centers cover this range of bushing sizes. Both front support bushing and tail center are located in V's in the fixture for max accuracy of location.

Star Cutter Co, PO Box 376, Farmington, Mich

MORE DATA? Circle 99, inside back cover



Hydraulic Clamping System Is Flexible, Low in Cost

Said to be the first complete clamping and actuating system that enables the tool engineer to design fixtures with multiple clamps (as many as 120) actuated from a single self-contained source, cost is within the range of ordinary screw, cam, or other mechanically actuated clamps and includes the complete hydraulic source.

System is manufactured in sizes and types suitable for the majority of clamping operations. Features include availability of all required components in a single stock line; variety of components to position and hold its pressure cylinders and pumps; ease of application afforded by full scale templets and single selection table with simple instructions; self-contained hydraulic supply permitting rotation or other movement of fixture.

Newton Hydraulic Tooling Co, Auburn, Mass

MORE DATA? Circle 100, inside back cover

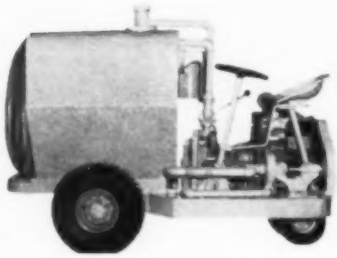
Tapping Attachment for Drill Presses Cuts Tap Breakage

Drill press attachment, available with adapters to fit all standard drill presses, will never break a tap if set correctly, according to the manufacturer. The tap is driven by a torsion spring, and tap torque is controlled to the ounce. When the tap hits an obstruction, the torsion spring is wound and makes an electrical contact. This automatically reverses the tap approximately one turn before letting it proceed normally.

The attachment, called Model 100 Tapspeedster, will tap a ¼-in.—20 hole ⅜ in. deep, allowing a three thread lead on the tap at 1220 rpm. This is 80 sfpm and the tapping cycle is completed in 7/10 second.

Smith Mfg Co, 208 St Clair Ave, Cleveland 13, Ohio

MORE DATA? Circle 101, inside back cover



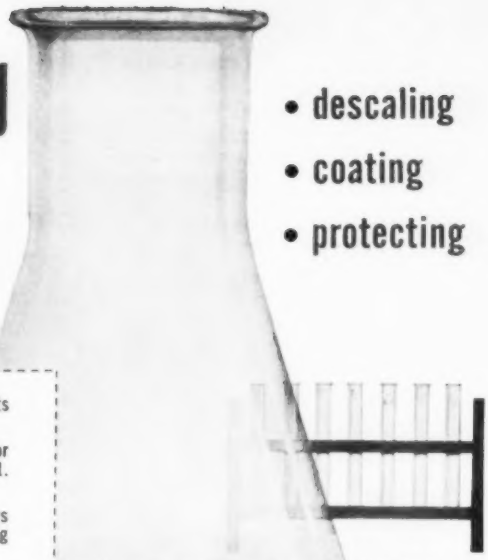
Self-Propelled Scavenger For Machine Tool Sludge

Unit collects sludge (mixed with chips, metal solids, waste oil, and water) by vacuum, transports it to the disposal area, and discharges it under pressure. In addition to machine tools, it services grease traps, drip pans, sumps, and settling tanks.

Max speed is 15 mph; body turning radius is 80 in. Engine-driven vacuum generator develops a suction of

FOR chemical processing OF ANY METAL... turn to Turco...FIRST!

- descaling
- coating
- protecting



ALUMINUM	**DESCALING:** Complete line of deoxidizing and polishing products for all alloys of aluminum. **COATING:** Economical and "quick fixing" conversion coating for application by spray, dip or hand methods. Approved to MIL-C-5541. Insures paint adhesion, stops aluminum corrosion. **PROTECTION:** Alkali-removable protective film for aluminum alloys both during storage (in plant and outdoor) and during fabricating practices.
STEEL	**DESCALING:** Complete line of alkaline and acid descaling media. **COATING:** Full line of iron, zinc and manganese hot and cold phosphate compounds to provide a tight coating for better adhesion of organic finishes and for oil absorption. These materials all meet the various requirements of applicable government specifications. **PROTECTION:** Versatile group of products for protection of parts from the elements.
TITANIUM	**DESCALING:** Approved and accepted process for conditioning and removing scale from all current titanium alloys, both after heat forming to 1150° F. and heat treating to 1750° F. **COATING:** Acceptable anti-galling and seizing conversion coating for the major alloys of titanium. Also used as base for lubes. Requires no post-heat treatments. **PROTECTION:** Easily removable coating to protect titanium against tightly adhering scale up to 1600° F. during hot forming or heat treating.
STAINLESS STEEL	**DESCALING:** Process for completely removing heat scale from various alloys (including 17-7 PH). **COATING:** Easily removable coating to protect stainless steel against tightly adhering scale up to 1600° F. during hot forming or heat treating.
MAGNESIUM	**DESCALING:** Non-electrolytic alkaline process for removing previous chrome pickle films as well as oily substances often found on magnesium. **COATING:** One-package powdered product which, when in solution with water, replaces Dow #17 treatment. Requires no mixing of chemicals. Eliminates chance of human error. **PROTECTION:** Single-package touch-up liquid to produce coatings equal to Dow #18 treatment. (Note: All magnesium processes mentioned above are approved for use by Magnesium Department, Dow Chemical Co.)

If your requirements call for *chemical processing of metal*, chances are you'll find your best solution in the *complete* Turco line. Charted here are a few of the chemical processes Turco manufactures for the metal-working industry. There are many other types of Turco processes that perform effectively on *any* known metal. Why not use the coupon below to write for free literature on the metal you are processing? There is no cost... no obligation.

TURCO

TURCO PRODUCTS, INC.
Chemical Processing Compounds
6135 So. Central Ave., Los Angeles 1, California
Factories: Newark, Chicago, Houston, Los Angeles, London, Rotterdam, Sydney, Mexico City, Naha (Okinawa)
Manufactured in Canada by B. W. Deane & Co., Montreal
Offices in all Principal Cities

For Cleaning or Metal Conditioning Problems— Turn to Turco ...First!

PLEASE AFFIX COUPON TO COMPANY LETTERHEAD

TURCO PRODUCTS, INC.
6135 So. Central Ave., Los Angeles 1, Calif.

Please send free literature on chemical processing of the metals checked

Titanium ____ Stainless Steel ____ Magnesium ____
Steel ____ Aluminum ____ Other (specify) ____

NAME ____

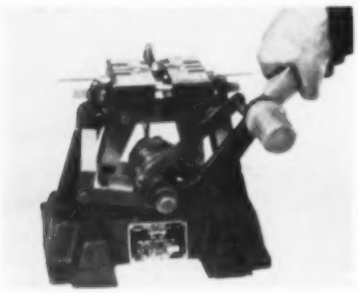
TITLE ____

A.M.

32 ft of water, enough to handle the heaviest semi-fluid industrial sludge. Collection rate is approx 60 gal per minute. Unit handles a full 3000-lb gross load, is of tractor construction, has three speeds forward, one reverse.

Gorske Industrial Equipment, 132 E 30th St, Indianapolis, Ind

MORE DATA? Circle 102, inside back cover



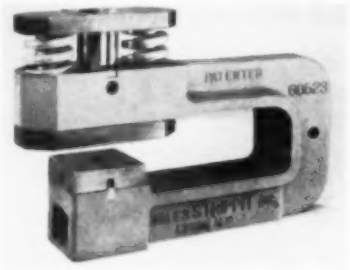
Bench-Model Tool Offered For Cold Pressure Welding

Hand-operated KBM-1 requires no current, heat, or fluxes; it produces a true weld by the Koldweld process. Manufacturer states that the physical and electrical properties of the joint are equal to that of the parent metal.

Tool will handle from No. 18 AWG (0.040 in.) to No. 8 AWG (0.128 in.) aluminum wire and from No. 18 to No. 9 (0.114 in.) copper wire. In addition to aluminum and copper and their alloys, some brasses, lead, zinc, nickel, silver, palladium, platinum, gold and tantalum wires have been buttwelded to themselves and to each other. Formex and enamel-coated wire can also be welded.

Kelsey-Hayes Co, Koldweld Div, Utica 4, NY

MORE DATA? Circle 103, inside back cover



Punching Unit Has Dual-Range Capacity

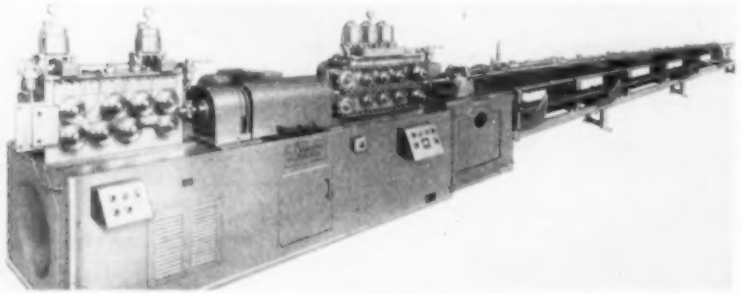
Strippit press-actuated hole punching unit may be altered from 0.250 to 0.750-in. capacity in mild steel by changing stripping mechanisms.

The unit has a removable punch assembly and two lift-out stripping springs. With mechanical springs in place, the unit has stripping pressure suitable for lower capacity work. Stripping pressure is greatly increased by installing Hydra-Springs, which use oil compressibility to develop six times the stripping power of mechanical springs.

Punch tips are available in round, oblong, square, or special shapes. Punch body is keyed to the holder to maintain accurate alignment.

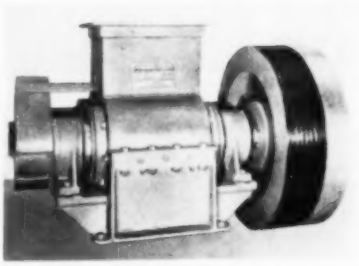
Wales-Strippit, Inc, 200 S Buell Rd, Akron, NY

MORE DATA? Circle 104, inside back cover



MOTOMATIC NO. 75, marking company's entry into the field of wire straightening and cutting machinery, uses the caterpillar chain feed technique which provides positive feed, eliminates twist, and speeds entire coil through the machine, reducing scrap to a minimum. Features include a simplified flying shear cutoff synchronized with the wire feed, and an electric variable speed drive using a dc motor or ac variable speed unit controlled by a single lever. Delivery of uniform diameter and lengths of straight, precision-cut wire at variable speeds up to 300 fpm is accomplished. Designed to handle a wide range of wire sizes, unit is equipped with an adjustable-center straightener arbor which permits increasing the size range of the machine up to 50%—*Vaughn Machinery Co, Cuyahoga Falls, Ohio*

MORE DATA? Circle 105, inside back cover



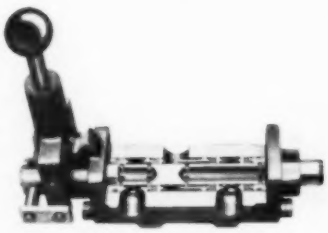
Sawtooth Crushers Assembled From Standard Components

This line of sawtooth crushers, tradenamed Laptooth, is assembled from standardized blade, shaft, spacer, housing, drive, and cleaner comb components to provide a wide range of adaptability.

The crushers, priced at $2,000 and up, can be used for reducing sponge metal forms, fragmenting chips for better scrap yields, processing welding rod fluxes, salvaging carbon and graphite electrode materials, breaking up rejected powder metal parts for reprocessing, working any friable mass to 1/16 to 2-in. sizes at high rates — without a high percentage of fines.

Robinson Mfg Co, Clifton, NJ

MORE DATA? Circle 106, inside back cover



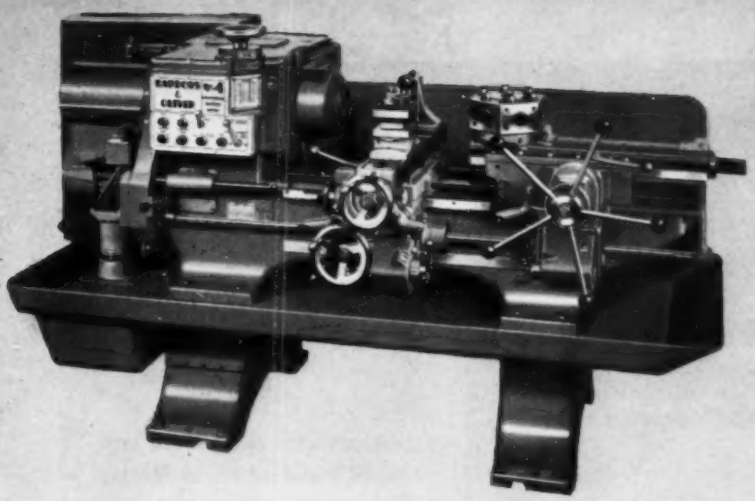
Hydraulic Operating Valves Offer Improved Seal Assembly

On this line of single piston hydraulic operating valves, the line pressure is the same both inside and outside the U-cup seals during the operating cycle. Thus the seals are floated across parts without distortion, shear, or undue wear. There is also no distortion of the stainless steel piston or the pedestals which position the seals.

They are available in sizes from ½ to 2 in. in three-way and four-way types. and up to 6 in. in the two-way or spray valve. The valves are cast in 88-10-2 bronze or steel for working pressures up to 2000 lbs.

Homestead Valve Mfg Co, Coraopolis, Penna

MORE DATA? Circle 107, inside back cover



RAM TYPE TURRET LATHES		
Size	Bar Capacity	Swing Over Bed
No. 1 Geared Electric	5/8″ or 13/16″	11-1/2″
No. 2 Geared Electric	1″ or 1-1/4″	13-1/2″
No. 3 Universal	1-1/2″ or 2″	15-1/2″
No. 4 Universal	2″ or 2-1/2″	18-1/4″
No. 7 Universal	2-1/2″, 3″ or 4-1/2″	21-1/2″
SADDLE TYPE TURRET LATHE		
No. 21 Universal	2-1/2″, 3″ or 4-1/2″	21-1/4″

BARDONS & OLIVER

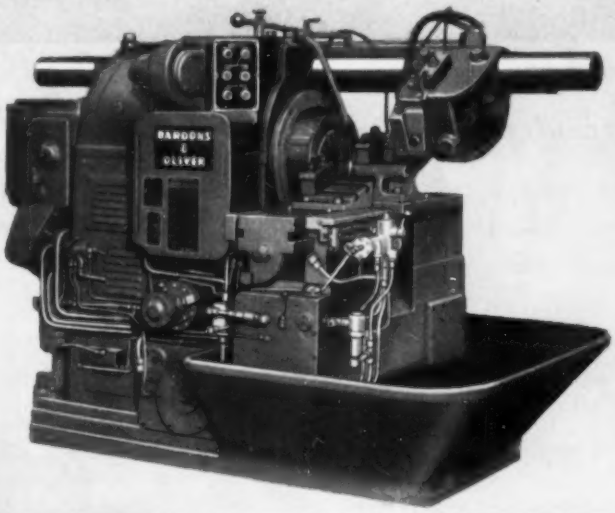
Turret Lathes . . . .

Each of the six Turret Lathes listed is a completely different machine, designed specifically for one range of work. All units on each machine, including the cross slide and carriage, and the turret slide and saddle, are "sized" for a particular work range. Thus adequate strength and rigidity is provided, maximum productive capacity is offered, and at the same time minimum operator effort is required. A complete line of tooling and attachments is available for each size of machine.

Cutting-Off Lathes

The Cutting-Off Lathes are designed to chamfer, form and cut off pipe, tubing, or bar stock with maximum efficiency. The number of pieces produced per hour often equals or exceeds that of much more expensive and complicated multiple spindle machines. Automatic loading tables, chamfer attachments, forming attachments, and automatic unloading devices are available for all sizes of Cutting-Off Lathes. These lathes are built as fully automatic, semi-automatic or hand operated.

CUTTING-OFF LATHES	
Size	Capacity
No. 32	2″
No. 33 and 34	3″, 4″ and 4-1/2″
No. 35 and 36	5-1/2″ and 6-5/8″
No. 38 and 39	8-5/8″ and 9-5/8″
No. 312 and 314	12-3/4″ and 14″
No. 316	16″

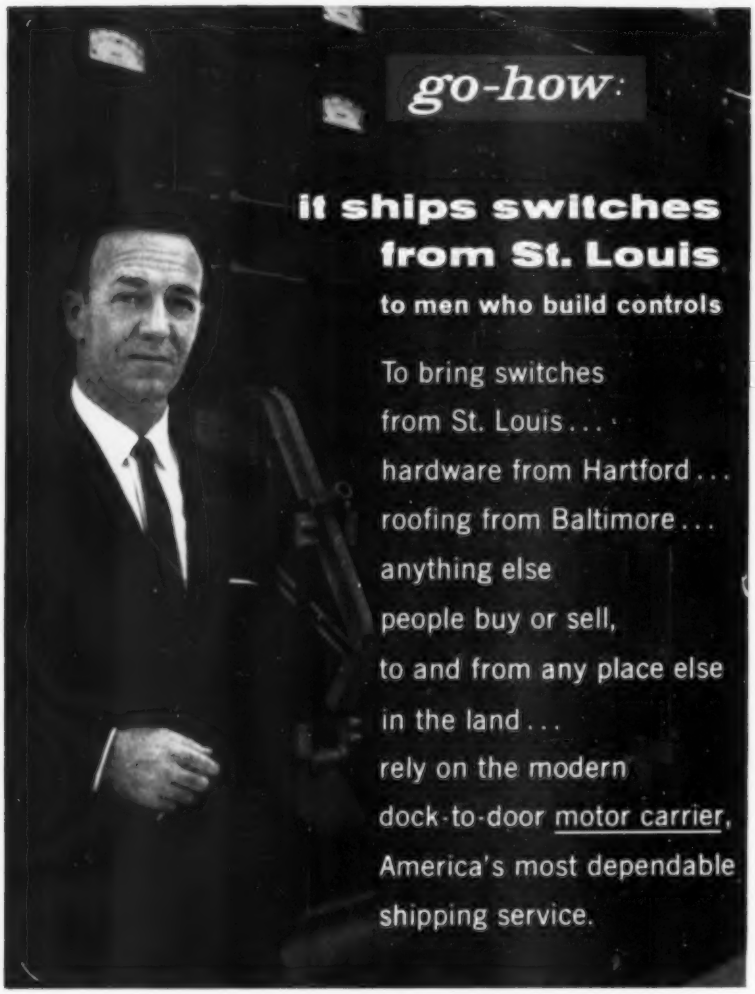


BARDONS & OLIVER

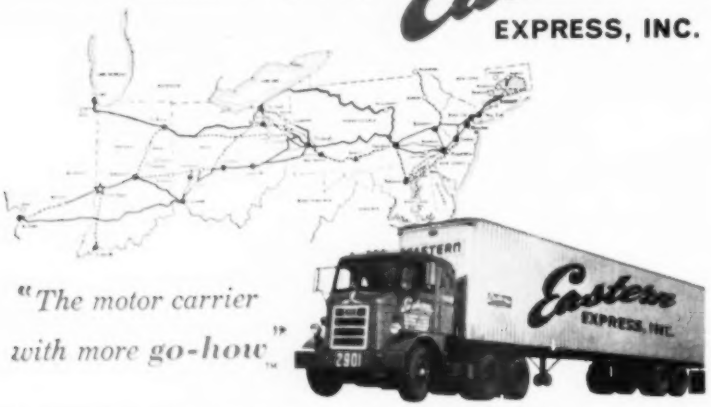
BARDONS & OLIVER, INC., 1133 WEST 9th ST., CLEVELAND 13, OHIO

Manufacturers of Turret Lathes and Cutting–Off Lathes

CIRCLE 261 READER SERVICE CARD

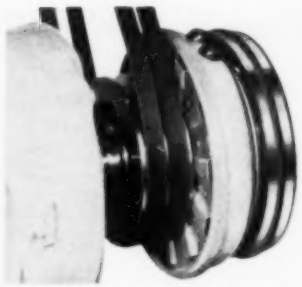


the direct, economical way to ship – Eastern EXPRESS, INC.



GENERAL OFFICES: 1450 WABASH AVENUE, TERRE HAUTE, INDIANA

Connecting the Eastern Seaboard with the Industrial Midwest: Akron • Baltimore • Bethlehem Bridgeport • Chicago • Cincinnati • Cleveland • Columbus • Dayton • Evansville • Ft. Wayne • Harrisburg Indianapolis • Jersey City • Metuchen • New York City • Philadelphia • Pittsburgh • St. Louis • Trenton • Zanesville



Electric Clutch and Sheave Unit Fits All Standard NEMA Motors

Electro-Sheave, combined electric clutch and sheave assembly for direct installation on all standard NEMA electric motor shafts, can be applied on new equipment or used to modernize existing machinery. Units are available in five sizes, from 1 to 25 hp.

Only a key and setscrew are needed to install the Electro-Sheave, in addition to making electrical connections to the clutch and brushholder from the control panel. The entire clutch and sheave is aligned and assembled at the factory.

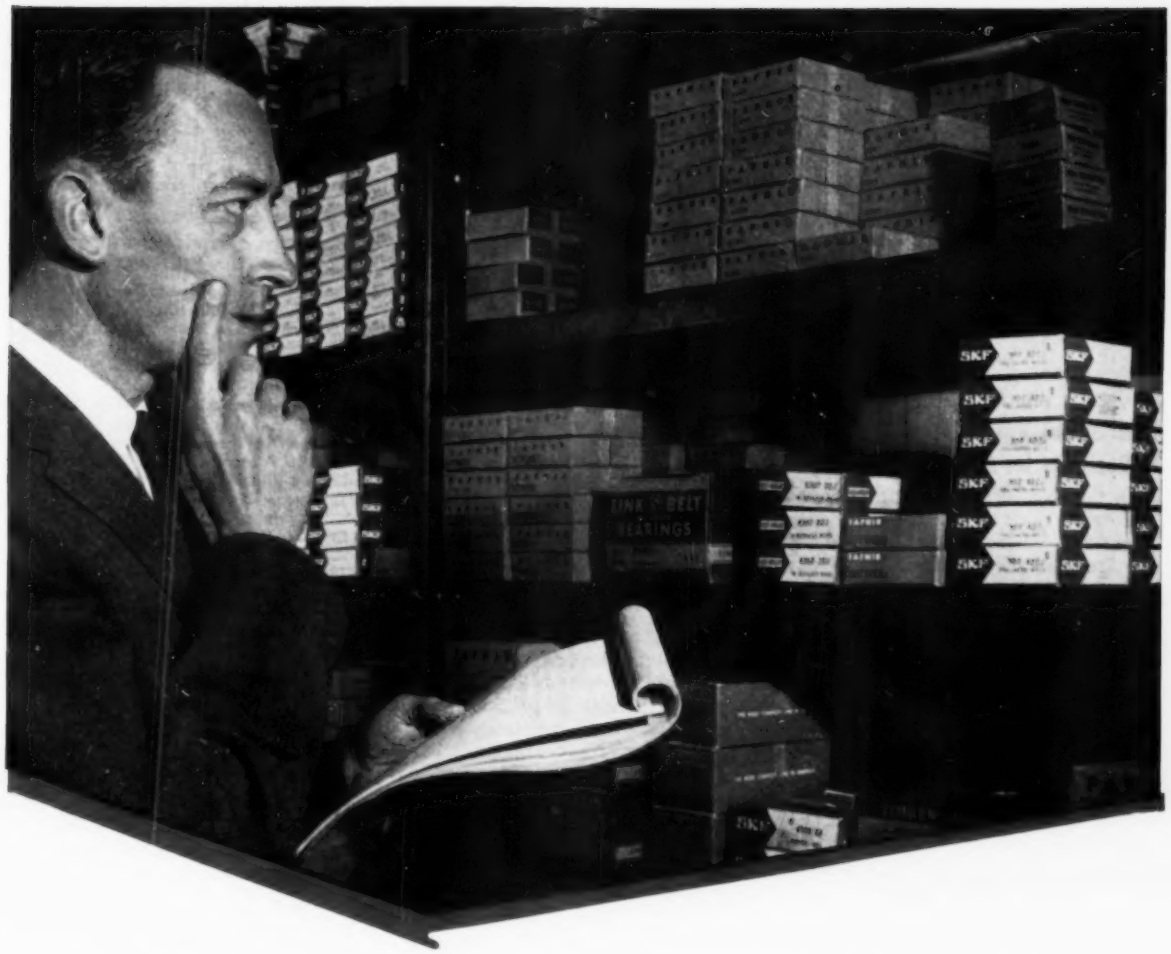
The new drives engage or release at any speed. For inching or jogging several starts are possible in less than one revolution of the clutch, minimizing wear and tear on motors, controls, or machinery.

Warner Electric Brake and Clutch Co, Beloit, Wis

MORE DATA? Circle 108, inside back cover

SMALL-HOLE DRILL, designed for use on drill presses, lathes, jig borers, and milling machines, is locked into position and drilling pressure is controlled with the operator's finger tips. The manufacturer claims that, because the operator can feel the correct cutting pressure, drills stay sharp up to 400% longer and breakage is practically stopped—*Hunter Tool, PO Box 564, Whittier, Calif*

MORE DATA? Circle 109, inside back cover



Bearings, Inc. customers don't worry about inventory control . . .

They let us keep *their* worries in *our* stockroom. We make surveys of the immediate, as well as long range requirements for all bearings in their equipment. Those carried in their stock are fast-moving. Expensive precision bearings, specials and other bearings purchased infrequently are carried in the Bearings, Inc. branch — ready for instant delivery, day or night.

If a shortage develops or production is interrupted, our customers know the bearings they need are in our stocks. A phone call and the bearings required will be on the way. Our customers know the value of this important service.

If bearing inventories are worrying *you*, why not call the Bearings, Inc. branch nearest you for help.

Providing bearing service in the North ➤ **BEARINGS, INC.**

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Bolanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville

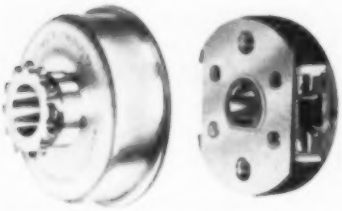
Mechanical Variable-Speed Drive Is Designed for Shaft Mounting

Unit that can be mounted directly to the drive shaft is designed for applications where space limitations require that the output shaft be at right angles to the transmission. It is said to be especially adaptable to applications requiring controlled speed in a lightweight, compact power drive.

Available in drip-proof or totally enclosed constructions, these ¼ to 3-hp models have speeds from 360 to 5.2 rpm and speed variations from 2:1 to 10:1. A wide variety of both electrical and mechanical modifications is available.

Sterling Electric Motors, 5401 Telegraph Rd, Los Angeles 22, Calif

MORE DATA? Circle 110, inside back cover



Automatic Centrifugal Clutches Offered in 1 to 7 hp Range

Line of three automatic clutch packages is designed for use on all powered equipment in the 1 to 7 hp range. Clutches have a self-energizing feature used in conjunction with centrifugal action to provide positive drive at a pre-selected engagement rpm. They can be supplied with built-in features for special applications.

Model C-300 coupling type unit is for use on an inline power train where reduction or right angle driven members are not required. Model S-300 semi-assembled unit (illustrated) is for use where the size of the sproket, gear, and pulley is so small that it will not permit a self-contained bearing and shaft. The A-300 assembled unit can be installed to any rotating shaft by inserting a key, sliding clutch onto shaft and tightening one set screw.

Comet Industries, 801 Elm Pl, Richmond, Ind

MORE DATA? Circle 111, inside back cover

Quick-Change Speed Reducer Increases Machine Capacities

Speed reducer for drill presses, lathes, boring mills, and similar belt-driven machines extends the machine capacity to permit larger work on normally light-duty machines.

The reducer provides extra operating torque at reduced machine speeds, and, according to the manufacturer, the attachment does not overload the machine and eliminates the danger of stalling or burning the machine motor.

Standard reduction ratios range from 6.5-to-1 to 1-to-1. Housings are of cast aluminum alloy. Prices start at $179.50, complete with ½-hp motor.

Pull-Gear Co, 25425 Mound Rd, Warren, Mich

MORE DATA? Circle 112, inside back cover

SMALL WASHERS and other small, hard-to-handle parts can easily be picked up and manipulated with this Lock-Griplier which is equipped with a locking mechanism to hold parts securely for indefinite periods of time—*Handicraft Tools, Inc, Div of X-acto, Inc, 48-41 Van Dam St, LIC 1, NY*

MORE DATA? Circle 113, inside back cover

ACCEPT NO SUBSTITUTE

MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
Centrifugally Cast Products Div., The Shenango Furnace Co., Dover, Ohio
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
Dayton Casting Co., Dayton, Ohio
Empire Pattern & Foundry Co., Tulsa, Okla. and Bonham, Texas
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machines Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundries, Inc., Chicago, Ill.
The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Lincoln Foundry Corp., Los Angeles, Calif.
Nordberg Manufacturing Co., Milwaukee, Wis. and St. Louis, Mo.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Foundries of FMC, Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Washington Iron Works, Seattle, Wash.
Dorr-Oliver-Long, Ltd., Orillia, Ontario
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

WRITE FOR YOUR FREE SINGLE COPY

Bulletin 32—
Meehanite Quality Control Assures Uniform Dependability.
Write today to Meehanite Metal Corporation, Department 5E, 714 North Avenue, New Rochelle, New York.

MEEHANITE®

CIRCLE 264 READER SERVICE CARD

TAKE ANY MEEHANITE CASTING

CUT IT IN HALF

unretouched photograph

HERE IS WHAT YOU WILL FIND

UNIFORM SOUNDNESS AND SOLIDITY through all sections regardless of complexity of design or size . . . *UNIFORM STRENGTH* properties . . . and *DIMENSIONAL STABILITY* "as cast" or hardened.

Meehanite Castings are made by a patented manufacturing process. Testing of every ladle of Meehanite® insures that engineering specifications are met. The microstructure and the quantity and form of graphite is accurately controlled within every casting and from casting to casting.

Specify Meehanite castings with confidence. There is a Meehanite foundry near you.

Free Literature: Bulletin 32 — Meehanite Quality Control Assures Uniform Dependability.

MEEHANITE BRIDGES THE GAP BETWEEN CAST IRON AND STEEL®

MEEHANITE METAL

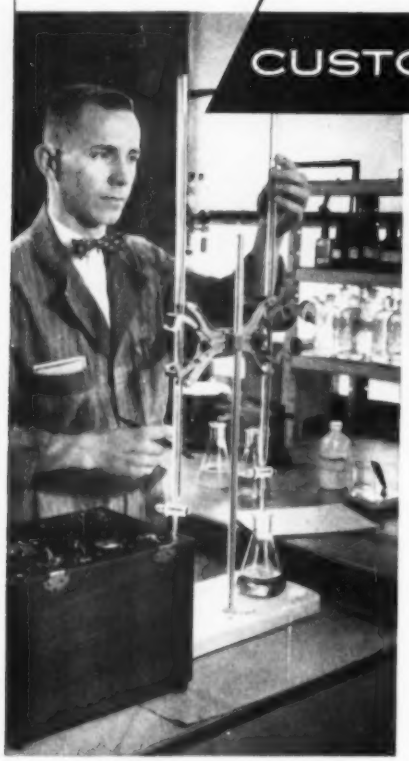
MEEHANITE METAL CORPORATION

NEW ROCHELLE
NEW YORK

CIRCLE 265 READER SERVICE CARD

consult the.... Roto-Finish

CUSTOMER'S MAN



FOR

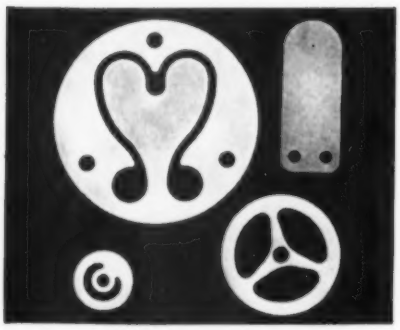
FINISHING PLUS+

RESEARCH AND TECHNICAL ASSISTANCE

Faced with the problem of cutting down finishing costs with no sacrifice in product quality, more and more production and management men are turning to Roto-Finish for complete finishing *service*.

In the Roto-Finish Laboratory, technicians analyze your problem to determine the process which provides the desired finish at minimum cost. Often, it is necessary *to develop a new compound* to meet a specific need.

Test runs are then made in the Roto-Finish Processing Department under production conditions. If desired, your local Roto-Finish Customer's Man will run these tests in your own plant; so that you can check the results at first hand, results like this...



Roto-Finish CASE HISTORY

PART: Refrigeration compressor flapper valves. • MATERIAL: Swedish steel. OPERATIONS PERFORMED: Deburr. Generate full radii on all edges. Remove stress risers. • RESULT: Fatigue resistance increased 500%.

ROTO FINISH®

Roto-Finish COMPANY

3723 MILHAM ROAD
KALAMAZOO, MICHIGAN
Phone: Fireside 3-5578

FOREIGN REPRESENTATIVES: ARGENTINA—Taller—Buenos Aires ● AUSTRALIA—A. Flavell Ltd.—Cheltenham ● BRAZIL—Commercial E. Industrial de Fornos Werco, Ltd.—Rio de Janeiro ● CANADA—Canadian Hanson & Van Winkle Co., Ltd.—Toronto ● ENGLAND—Roto-Finish Ltd.—Hemel Hempstead ● FRANCE—Societe Roto-Finish—Paris ● GERMANY, AUSTRIA, NORWAY, SWEDEN, SWITZERLAND—Metallgesellschaft A. G.—Frankfurt a. M.—Germany ● HOLLAND, BELGIUM, LUXEMBURG—N. V. Roto Finish Maatschappij—Delft, Holland ● ITALY—Societa Roto Finish a R. L.—Milan ● SPAIN—Instituto Electroquimico, S. A.—Barcelona

NEW SHOP EQUIPMENT

Anchor bushings and stops provide means to make and position drill templates. Bushings and stops are simply pressed into drilled or punched holes in 0.060-in. or thicker aluminum template material. Bushings accommodate drill sizes No. 55 through 7/16 in. Stops have ½-in. dia and can extend beyond template surface from 0.15 to 0.375 in.

Hi-Shear Rivet Tool Co, 2600 W 247th St, Torrance, Calif

MORE DATA? Circle 114, inside back cover

Textured steel in a variety of colors is said to be comparable in appearance to anodized aluminum with the durability of brass plated or copper plated steel. Priced as low as 12¢ per sq ft, it is available in sheets or coils in widths up to 30 in. with pattern depth varying from 0.004 to 0.060 in.

Ardmore Products, Inc, Aldene Rd and First Ave, Roselle, NJ

MORE DATA? Circle 115, inside back cover

Standard boring bars using throwaway carbide inserts are introduced in two new styles, AS and AT, for operations which don't require micro-adjustment of diameter. They are available with either positive or negative 5° rake, in sizes from 1¾ to 3 in.

Wesson Co, 1220 Woodward Heights Blvd, Detroit 20, Mich

MORE DATA? Circle 116, inside back cover

Four-way manual valve is designed for use on oil systems with pressures up to 3000 psi. This lightweight, low-cost valve, constructed of high-tensile heat-treated aluminum, is capable of withstanding proof pressures of 4500 psi and instantaneous surges of 9000 psi. Port sizes range from ¼ to 1 in. npt with a rated flow from 7 to 38 gpm.

Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58, Calif

MORE DATA? Circle 117, inside back cover

Air-hardening specialty steel, designated Dynaflex, resists softening at temperatures up to 1000 F and provides high toughness and ductility at tensile strength levels up to 300,000 psi. It also reported to have good weldability, relatively low coefficient of thermal expansion, better than average corrosion and oxidization resistance, low strategic alloy content, and ease of forming and working.

Latrobe Steel Co, Latrobe, Penna

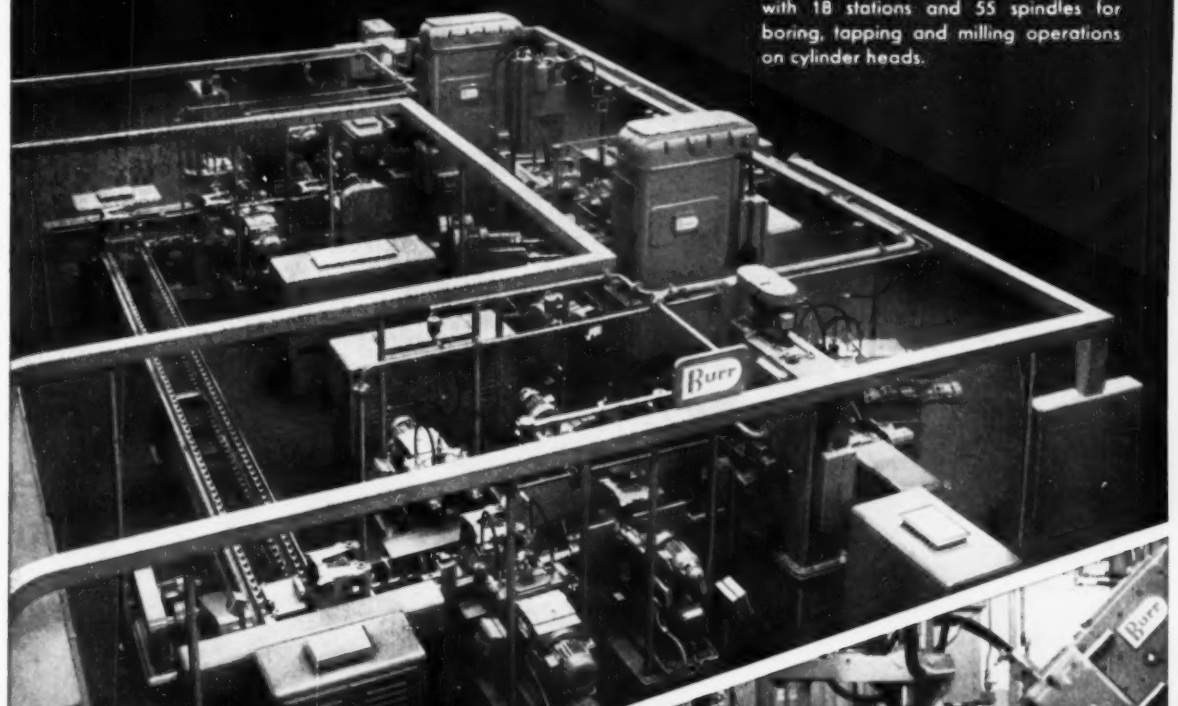
MORE DATA? Circle 118, inside back cover

Burr

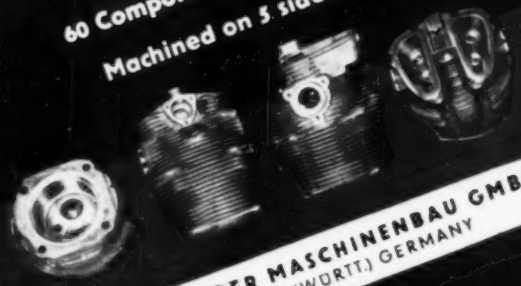
TRANSFER MACHINES

HENKEN

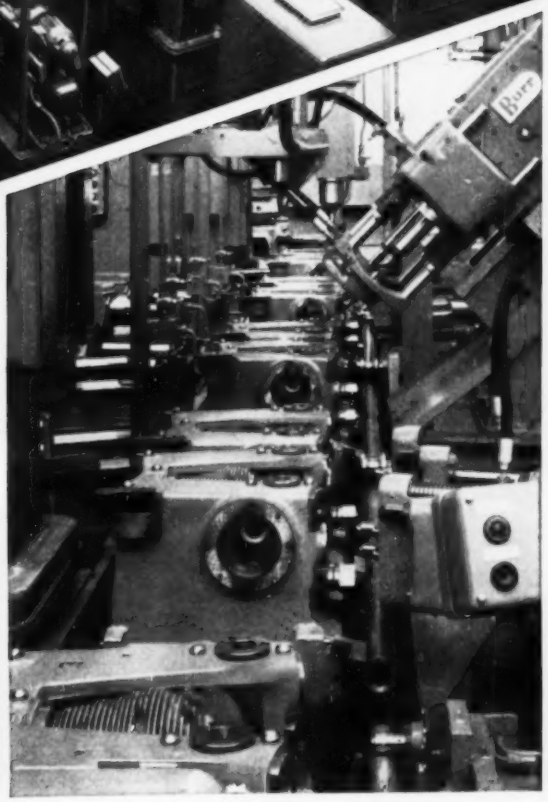
TRANSFERLINE
with 18 stations and 55 spindles for boring, tapping and milling operations on cylinder heads.

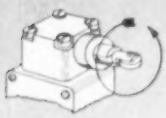


60 Components per hour
Machined on 5 sides

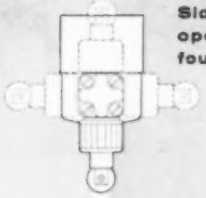


LUDWIGSBURGER MASCHINENBAU GMBH.
LUDWIGSBURG (WÜRTT.) GERMANY





Side roller plunger rotates through 360° and locks in any position



Side plunger and side roller plunger operating heads mount in any of four positions

New 203LS1 "Plug-in Limit" switch with side roller plunger actuator

New 204LS1 "Plug-in Limit" switch with side plunger actuator

Two new switches added to sealed "Plug-in Limit" line

The addition of these two new switches greatly increases the usefulness of the pace-setting "Plug-in Limit" line. Like the other "200LS" switches, they are rugged, reliable, compact, and completely sealed against oil, water, dirt and dust.

These new units also share the quick-change plug-in feature, as illustrated and described at upper right, which virtually eliminates downtime and gives unmatched versatility of machine control.

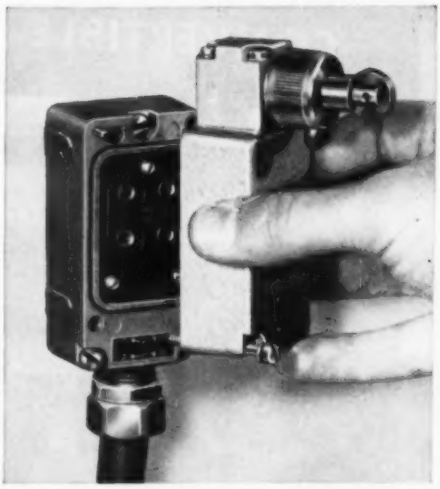
"Plug-in Limit" switches are two-circuit double-throw. Electrical rating is 10 amps., 120, 240, 480 vac; ½ H.P. 120 vac; 1 H.P. 240 vac; 0.8 amp. 115 vdc; 0.4 amp. 230 vdc; 0.1 amp. 550 vdc. Pilot duty rating is 600 vac max. They meet NEMA Industrial Control Standards.

See the Yellow Pages for nearby distributors and MICRO SWITCH branch offices. For details on 58 different limit switches, send for Catalog 84.

MICRO SWITCH Precision Switches

H HONEYWELL

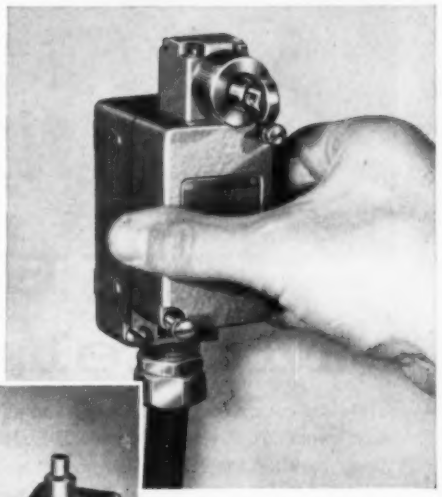
PULL OUT



You can replace or interchange a "Plug-in Limit" switch in 20 seconds

A "Plug-in Limit" switch plugs into the terminal enclosure like a radio tube and is secured by two No. 10 screws. Together, the two parts form a sealed assembly. All eight switches in this series use the same terminal enclosure—18PA1. A switch can be replaced or control arrangement changed in as little as 20 seconds.

PLUG IN



With the two new switches, the "200LS" series is now available in 8 different types to meet an even wider range of industry needs. The six others are, left to right: 201LS3 adjustable arm rotary actuator; 205LS1, roller plunger actuator; 208LS1, coil spring actuator; 201LS1 roller arm actuator; 201LS10, rod actuator; 202LS1 push plunger actuator.

MICRO SWITCH . . . FREEPORT, ILLINOIS
A division of Honeywell
In Canada: Honeywell Controls Limited, Toronto 17, Ontario

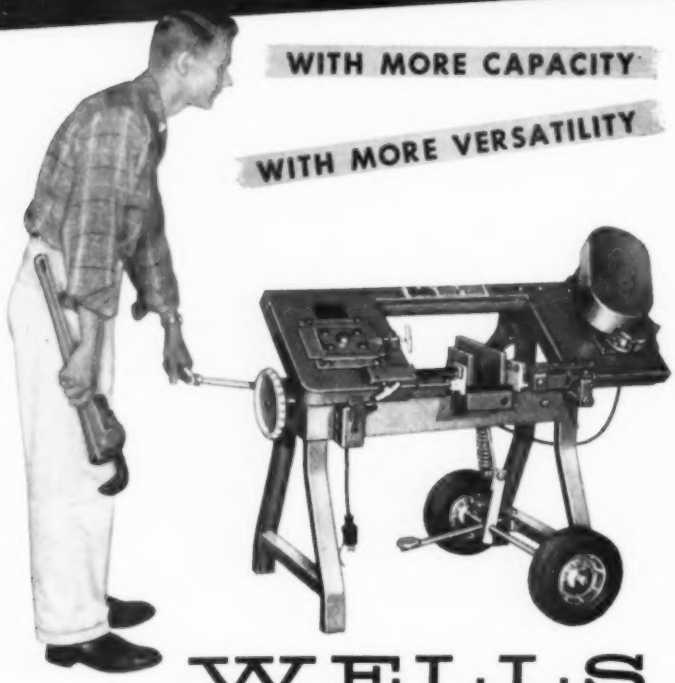
H HONEYWELL **Honeywell**
MICRO SWITCH Precision Switches

CIRCLE 269 READER SERVICE CARD

A NEW, COMPLETELY MOBILE CONVERTIBLE BAND SAW

WITH MORE CAPACITY

WITH MORE VERSATILITY



WELLS Model 58-B

Here's a compact, convertible band saw designed for shop or "job-site" work . . . the Wells Model 58-B. It provides the capacity you've been looking for . . . at a modest price. Equipped with optional wheel handle unit, the Model 58-B becomes completely mobile . . . easily rolls from job to job. Use the 58-B as a horizontal cut-off machine (capacity: 6" x 10") or swing the head to upright position, install work table and it's a utility vertical band saw. For complete details on this double duty—double value band saw, see your Wells Distributor or write for Bulletin 262.

SPECIFICATIONS

Capacity:		**Floor Space**	19" x 47"
Rectangular	6" x 10"	**Height (Frame Vertical)**	52"
Round	6" Diameter	**Height (Frame Horizontal)**	37"
45° Angle	5" x 5"	**Vertical Capacity:**	
Speeds, f.p.m.	76—141—268	Work Table	7⅛" x 10"
Blade Size	½" x .025" x 93"	Throat Height	9½"
Motor	½ H.P.	Throat Depth	7¾"
Width of Bed	8½"	**Net Weight (Approx.)**	220 lbs.
Floor to top of Bed	22¼"		

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT RD., THREE RIVERS, MICHIGAN

FIELD REPORT...

Kearney & Trecker Forms Division To Handle Subcontract Work

Contract division to handle all types of subcontract work for other industries has been established by the Milwaukee machine tool builder. In addition to contract work on special purpose machinery (non-machine tool), new division will aim at specialty work in the areas of aircraft, missile, and automotive production, and general purpose work that would make use of company production facilities that are not otherwise available to defense industry contractors and producers of consumer goods. It'll also be active in securing work which can be processed on the company's new fully automatic tape-controlled Milwaukee-Matic. Elmer H Behrens has been named sales manager and John P Bunce manufacturing manager of the division.

Philco Gets $13.5 Million Order

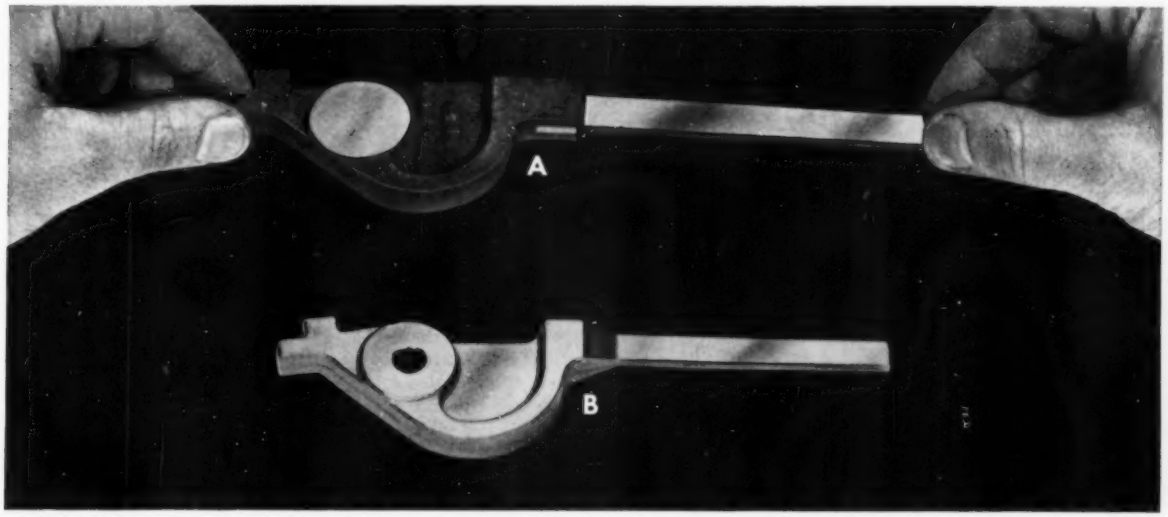
Philco Corp's Philadelphia plant has a Navy contract for construction of Sidewinders, air-to-air missiles. It's estimated that order will mean additional employment for hundreds at the facility.

Chance Vought's New Plant Producing Hydraulic Assemblies

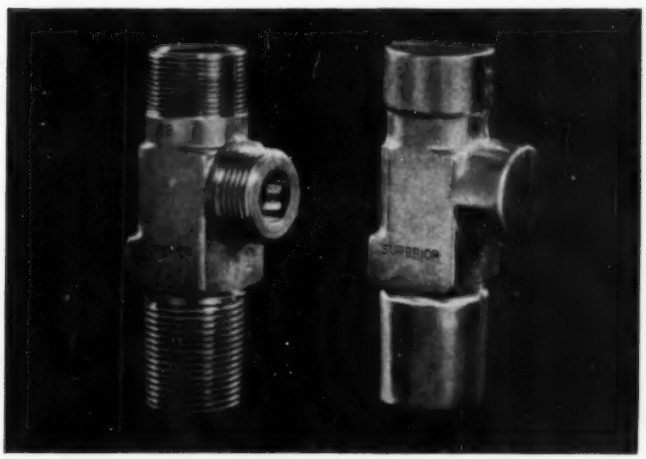
Company's new $1 million hydraulic research and manufacturing facility at Dallas for production of precision cylinders, pumps, valves, and servo systems is turning out various hydraulic components for the F8U-1 fighter and is scheduled to produce an increased number of hydraulic

"Automation cut down production labor 99%, increased our maintenance force 100%."

QUALITY CONTROL PLUS SAVINGS Value analysis suggested the use of a die-pressed forging. The result: an 85% cost reduction and a stronger, tougher part.



SWITCH BLADE in overspeed limiting device on large General Electric motor-generators was originally an assembly **A**—an arm brazed to a brass casting which was machined, slotted, and drilled. After review in the company's Value Analysis program, assembly was replaced by Anaconda die-pressed brass forging **B**. The superior strength of twice-wrought metal made possible a one-piece part. The excellent finish and consistent dimensional accuracy of the die-pressed forgings eliminated all machining but the drilling operation. The over-all cost is 15% of the original part.



VALVES FOR CHLORINE AND FLUORINE shipping containers must have unusual corrosion resistance and high strength. Superior Valve & Fittings Co., Pittsburgh, specialists in handling halogens, looked for a forging alloy that would be suitable. American Brass Company metallurgists suggested die-pressed forgings of a slightly modified Everdur*-1014, an aluminum-silicon bronze, for this chlorine-fluorine service, and this customer is finding wide use for it in other severe service, too. The twice-wrought metal of Anaconda die-pressed forgings has dense structure to prevent leaks—strength and toughness to take rough handling. Yet it can be machined in automatic-chucking machines resulting in good cost control.

THE vital job of controlling quality *and* costs may be easier than you think. Anaconda technical specialists will gladly help you find the right alloy and mill form to do both. See your American Brass Company representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5940

DIE-PRESSED FORGINGS SPECIAL-SHAPE TUBES
EXTRUSIONS FABRICATED METAL PARTS

products of

ANACONDA®

made by The American Brass Company

1200 CUTS per BLADE...

in 12" x 5" x 4" TEMPERED FOAM GLASS BLOCKS

with NEW ATKINS carbide-tipped BAND SAW

• New ATKINS Carbide-Tipped Band made *1200 cuts* in tempered foam glass blocks compared to *1 cut per blade* previously experienced by well-known glass manufacturer. Savings in blade cost, labor and downtime are understandably remarkable! New ATKINS blade cuts plastics, masonite and many other abrasive, hard-to-cut materials. Use on existing machines; no additional equipment required.

Write factory for complete information and prices. Describe material to be cut, cutting machine, wheel size and present cutting methods.

Now in our SECOND CENTURY of Service to Industry

ATKINS SAW DIVISION
BORG-WARNER CORP.

INDIANAPOLIS 9, INDIANA

Field Report . . .

assemblies for the F8U-2. In addition to producing hardware for Crusaders, new unit can do R&D work on components for other programs. Vought has been making its own hydraulic assemblies for years in its experimental area; with the new facility it can now go into quantity development and production. Shop consists of more than 90 pieces of equipment including ultrasonic cutting equipment and cleaners, crush and optical grinders, modified vertical mill with hydraulic tracing attachment, facilities for testing hydraulic cylinders at up to 5000 psi pressure, and inspection equipment with gages capable of checking to tolerances of 10 millionths of an inch.

Crown Cork & Seal Building $7 Million Atlanta Plant

Expansion of the Philadelphia company's manufacturing operations in the Southeast is spelled by construction of initial section of a new 250,000 sq-ft facility on a 40-acre tract, scheduled for completion by end of the year. Production facilities include high-speed can manufacturing lines, high-speed multiple die end press lines, and a strip feed press line.

Black & Decker Forms Subsidiary

Black & Decker Manufacturing Co, Towson, Md, has set up a subsidiary, Master Power Corp, that has acquired the operations of the Master Pneumatic Tool Co, Bedford, Ohio, and Master Pneumatic Tools, Ltd, of Toronto, Canada. B&D expands its product range through the acquisition by addition of complete Master line of pneumatic tools to its own line of electric tools.

(Continued on p 167)

"Johnson . . . if that shaft is spoiled you're fired!"

4 TIMES as many CUTS per BLADE...

in 24" x 24" CARBON BLOCKS

with NEW ATKINS carbide-tipped BAND SAW

• In a leading plant, cutting 24" carbon blocks, ATKINS new Carbide-Tipped Band outperformed previous cutting methods *by at least 4 to 1.* ATKINS Carbide-Tipped Bands are designed to cut foam glass, carbon blocks, plastics, masonite board, paper back books, cork and many other abrasive and hard-to-cut materials. Use on existing machines, hand or power fed. No additional equipment required.

Write factory for complete information and prices. Describe material to be cut, cutting machine, wheel size and present cutting methods.

Now in our SECOND CENTURY of Service to Industry

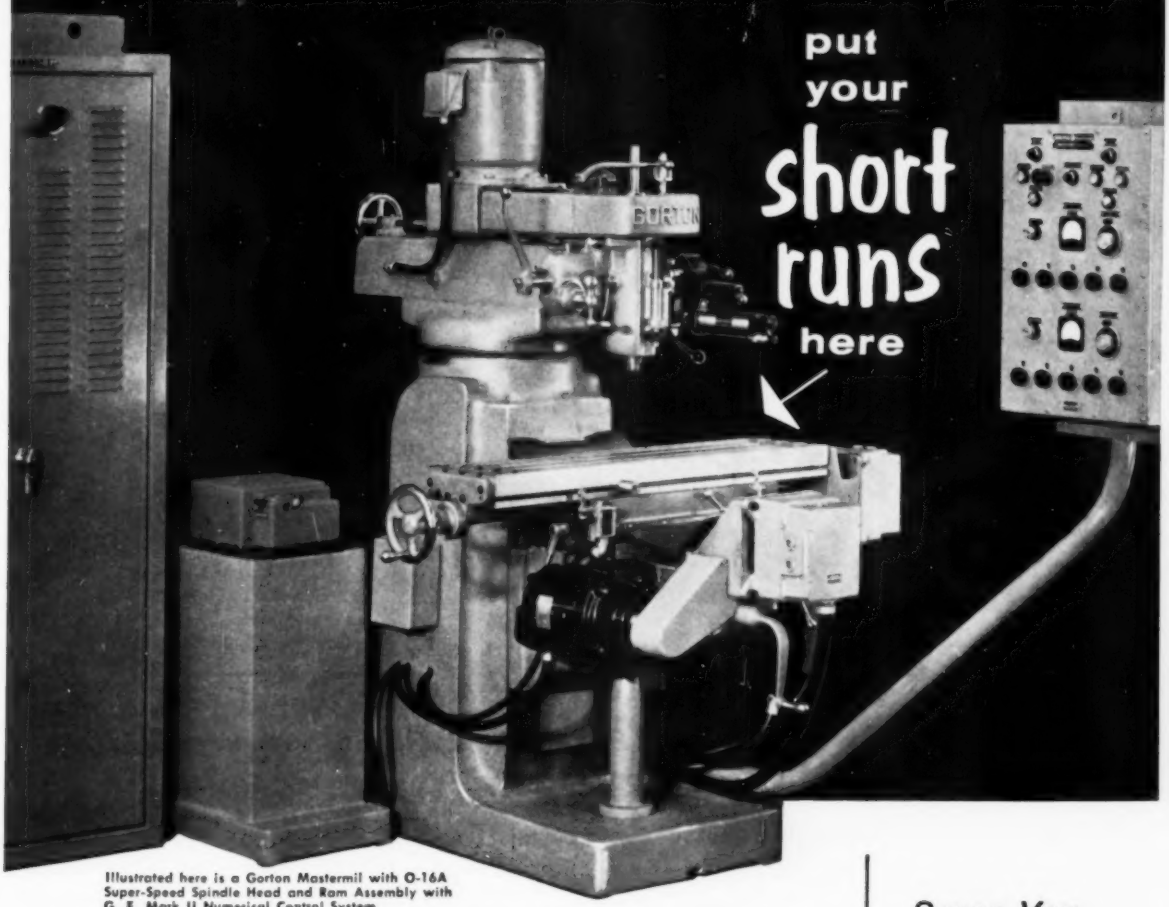
ATKINS SAW DIVISION
BORG-WARNER CORP.

INDIANAPOLIS 9, INDIANA

CIRCLE 272 READER SERVICE CARD

CIRCLE 273 READER SERVICE CARD

FOR NUMERICAL CONTROL AT LOWEST COST



Illustrated here is a Gorton Mastermil with O-16A Super-Speed Spindle Head and Ram Assembly with G. E. Mark II Numerical Control System

GORTON NUMERICAL CONTROL

is field tested and proved in use

This is how Gorton Numerical Control saves you money on short runs:

- — eliminates elaborate and costly tools, dies, jigs and fixtures
- — wastes no time because operator does not "pace" the work
- — makes no mistakes because operator skill not required
- — extreme, repetitive accuracy is easy and automatic
- — change overs in set-ups can be made quickly
- — signals operator when tool changes are needed
- — guides cutter in close quarters without damage to work or cutter
- — making punched tape is simple typewriter operation

Punched tape . . . or magnetic tape control . . . is available to you on SIX standard Gorton machines and also on Gorton custom-designed machines. You'll be agreeably surprised when you learn the low cost of Gorton Numerical Control and how much more it gives you for your money. For full information write

Saves You Money on —

- face milling
- side milling
- end milling
- straight line cavity milling
- slotting
- drilling
- reaming and boring

Your letterhead inquiry will receive prompt attention.

GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

1505 Racine St., Racine, Wisconsin

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

NOW—A LOW-COST LAPMASTER

Specifically Designed for Maintenance Lapping

new

Lapmaster® MODEL 10

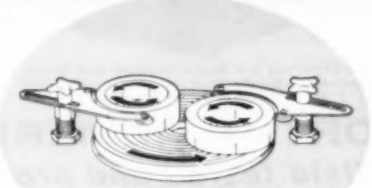
Saves Time and Money On:

VALVE SEATS • MECHANICAL SEALS
COMPRESSOR DISCS • DIESEL INJECTOR
AND OTHER MISCELLANEOUS PARTS

- Faster than old lapping methods.
- *Consistently* laps to flatness within .0000116" and micro-inch finishes of 2 to 3 RMS.
- Operator need not be experienced.
- Handles parts up to 7" diameter to meet all usual maintenance lapping needs.
- Will handle parts of any shape or form . . . any metal, ceramics or plastic.
- Automatically controlled lapping cycle.
- Size: 18" x 13" x 12". Weight: 133 lbs.
- Operates on any 110 volt—60 cycle—single phase outlet.

NO TIME LOST

in Reconditioning Lap Plate with Exclusive LAPMASTER PRINCIPLE



No down time for truing lap plate . . . conditioning rings automatically keep plate flat and true.

Lapmaster®
. . . THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

WRITE FOR THE COMPLETE LAPMASTER STORY

Write for bulletins describing the Lapmaster line and chart on measuring flatness.

A product of
Crane Packing Company
6436 OAKTON ST. • MORTON GROVE, ILL. (Chicago Suburb)
In Canada: Crane Packing Company, Ltd., Hamilton, Ont.

Field Report . . .

Missile Contract at Motorola

Motorola Inc's Military Electronics Division at Phoenix, Ariz, has a $4 million AF order for Bomarc missile parts. Job is a continuation of existing contracts and calls for production of 168 radar guidance beacons and command data links. Company also has an order for missile telemetry systems to be used in the Jupiter program.

Consumable Electrode Furnace Licensed for European Production

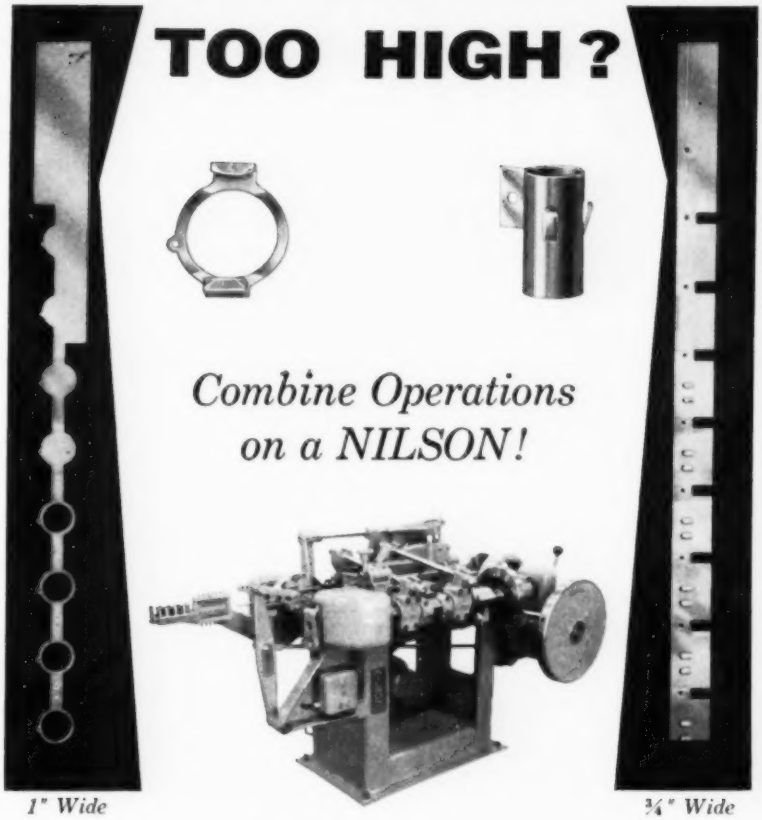
Negotiations have been completed between Stein & Roubaix of Paris and Allegheny Ludlum Steel Corp and the Lectromelt Division of McGraw-Edison Co whereby the consumable electrode vacuum melting furnace will be produced and sold throughout Europe by the French firm. Furnace produces some of the high-alloy super-metals that are required in the missile and supersonic aircraft fields and in atomic energy. Allegheny Ludlum first announced its commercial development in 1955; two years later McGraw-Edison's Lectromelt Division was licensed to build and sell the furnaces to other metals producers in the US.

BOP Moves Out, Chevy Moves In

Operations at GM's plant at Framingham, Mass, will be converted from assembly of Buicks, Oldsmobiles, and Pontiacs to Chevrolet passenger cars. BOP production at Framingham, will be transferred to that division's plant at Linden, NJ, where expanded employment opportunities are expected to result. Employees at Framingham

"It was raining so my wife made me bring the clothes to dry!"

STAMPING COSTS TOO HIGH?



Combine Operations on a NILSON!

1" Wide *¾" Wide*

Stamping costs soar when additional operations must be performed. But a Nilson 4-Slide with built-in press combines stamping *and* forming into one automatic operation . . . no secondary handling . . . ensures product uniformity.

The electronic component shown at left is made of spring-tempered Phosphor bronze, .010" thick. Specifications called for .0002" tolerances on critical dimensions —and allowed a total cumulative error of only .001"!

Solution: A simple progressive die and ingenious 4-slide forming tools are producing this piece at the rate of two finished parts per second. Production costs are substantially lower than if tooled for a conventional press.

With *nine* standard working motions available on a Nilson 4-Slide, production performance is limited only by the ingenuity of the tool designer!

If you produce wire forms or small metal stampings, Nilson's 4-slide forming techniques can point the way to lower costs. Send prints or sample parts for engineering recommendations.

Write today for the Nilson General Catalog on Automatic 4-Slide Equipment.

Parts & production data, courtesy of Plaza Tool & Die Corp., Long Island City, N.Y.

NILSON

THE A. H. NILSON MACHINE CO.

601 Bridgeport Avenue • Shelton, Conn.

AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

ENGINEERED INSTALLATION BY MID-WEST MEANS EXTRA BENEFITS AT NO EXTRA COST

It takes the correct abrasive, properly installed, to meet the production requirements of both time and quality. The product sales engineers of Mid-West will help you choose the right abrasive to meet *your* particular requirements, in *your* own plant, on *your job* . . . whether it be old applications, new set-ups or quality control. These highly trained abrasive specialists are backed by the constant research and testing of the Mid-West Abrasive Company in their efforts to meet and exceed the demands of the ever-changing industrial scene. Your call will bring you one of these skilled men without obligation.

Mid-West is one of only three abrasive companies offering customers a complete line of abrasive products: sandpaper, grinding wheels, honing stones, abrasive grain and grinding machines.

MID-WEST ABRASIVE CO.

510 S. Washington St. • Owosso, Michigan

Field Report . . .

will become employees of Chevrolet Motor and Fisher Body Divisions when responsibility for management of the plant is transferred sometime before the end of the year.

Pacific Semiconductors, Inc. . . .

. . . has started work on a second phase of its $10 million advanced engineering, production, and administrative center near the Los Angeles International Airport. PSI is engaged in research, development, and manufacture of semiconductor devices for commercial and military uses, including computers, communications systems, guided missiles and satellites. New addition is scheduled for completion by Sept. Employment, approximately 500 a year ago, has now reached 850 and is expected to rise to 1200 by year's end. Company estimates that the entire center, with an area of 300,000 sq ft, will be required in the early 1960's.

North American Aviation Negotiating With Foster Wheeler

Agreement has been reached whereby North American Aviation, Los Angeles, would acquire Foster Wheeler Corp, New York. Both companies plan to work out an agreement that'll be submitted to their respective stockholders for approval at special meeting to be called early in July.

Super Tool Co . . .

. . . Detroit subsidiary of Van Norman Industries, is opening a major warehouse center in the Chicago area. It'll carry cutting tool stocks in quantities equivalent to those of the Detroit plant.

(Continued on p 172)

". . . Smith, when I put you on piecework I wasn't thinking of one a month . . ."

Costs down, production up with Continuous-Cast Bronze Castings. Asarco's continuous-cast shapes can save you money many ways. And help you toward a better product in the bargain! The alloys produced by continuous casting meet the same specifications as other castings but in performance, they're measurably superior in strength and hardness. Second, there's no greater production efficiency than working with the shapes you want in the continuous lengths you want, in dimensions closer to final finished parts. Asarcon® 773 (SAE 660), general purpose bearing bronze, is immediately available from stock in 260 sizes, rods and tubes, up to 105″ lengths, ½″ to 9″ diameters. Special shapes can be made to order. Write: Continuous-Cast Products Department, American Smelting and Refining Company, Perth Amboy Plant, Barber, New Jersey, Whiting, Indiana. West Coast Distributor: Kingwell Bros., Ltd., 457 Minna St., San Francisco. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

CONTINUOUS-CAST DEPARTMENT OF

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

CIRCLE 278 READER SERVICE CARD

WHEN BUYING FOR PRODUCTION—equipment, accessories, materials, supplies—the question often arises: "Who makes it? Where can we get it?"

Reach for the American Machinist Buyers' Guide Issue and you have the answers in an easy-to-use, complete and efficient package.

Bigger... and most complete The newest edition of the Buyers' Guide—your most effective, efficient buying tool—is now in preparation. To be issued in September, 1959, the Buyers' Guide Issue will put at your fingertips the...

Buyers' Guide Section...over 27,000 listings...products of 3,400 manufacturers shown under 1,800 separate product headings;

Metals Supply Section...city-by-city listings of steel warehouses (with types available) plus warehouse list of non-ferrous metal sources (aluminum, copper, brass);

Machine Tool Distributor Directory...local sources for machine tools in your area...presented both alphabetically and by machine tool builders ...with phone numbers and addresses;

Technical Metalworking Sections ...eight editorial-advertising sections covering principal Metalworking functions (Machining, Tooling, Press-Working, Inspection, Materials, etc.).

Easy to use... for you The American Machinist Buyers' Guide Issue is designed with *your needs in mind*. Sim-

plicity of use by production executives guides its preparation. Thus you get...

integrated information sections... major portions of the issue work together... Buyers' Guide Section leads you to Warehouse and Distributor directories... bold-face listings for advertisers refer you to specific pages where you can obtain complete application/specification data from manufacturers;

different colored paper for major sections...enables you to put your hand on exactly the information desired without time-consuming searching... no complicated code references;

"lie flat" binding...allows you to leave volume open at a specific page for reference without losing your place.

Preferred by production management

Just as regular issues of American Machinist are your best source for information on techniques, processes and "what's new", so the Buyers' Guide has become accepted as Metalworking's #1 buying data source.

In a survey* among American Machinist subscribers, it was found that, next to the Yellow Pages of the phone book, the Buyers' Guide was Metalworking production management's most popular reference for industrial product source data.

If the product is made or bought by Metalworking...look first for the source in the Buyers' Guide Issue (the new edition in your hands September 1959).

*available on request

Another RCA AUTOMATION Product for Better Materials Handling

Low cost automatic

RCA ROTARY HOPPER

Compare the cost and features of these new RCA Automatic Rotary Hoppers, and you'll see why they are gaining such rapid acceptance! They provide every needed operating feature, yet are offered at remarkably low prices . . . beginning at $265, f.o.b., Detroit.

Features:

- **High-speed—up to 20,000 parts per hour.**
- **Handles cylindrical, rectangular, headed disc shaped and other parts.**
- **Parts orientation performed by feed track, not the bowl.**
- **Feed tracks easily changed by loosening one screw.**
- **18", 24", 30" bowls available.**
- **Rugged construction—cast-iron frame; driving mechanism supported by heavy duty self-aligning bearings.**
- **Standard gear-head motor.**
- **Safety-slip drive protects parts and equipment.**
- **Price includes cleats on selector ring and mounting block for tracks.**
- **Demand-control mechanism and wide variety of discharge tracks furnished at modest extra cost.**

Write today for complete information on low-cost RCA Rotary Hoppers. To permit analysis of your needs, send two samples of each part to be handled, and indicate required production rates. Details of other RCA Automation Equipment available on request.

RCA

Tmk(s) ®

RADIO CORPORATION of AMERICA

INDUSTRIAL AND AUTOMATION DIVISION
12605 Arnold Ave., Detroit 39, Mich.

Field Report . . .

West Germany Buys Starfighters

Lockheed Aircraft's Calif Division has contract from the West German government for purchase of 96 F-104 Starfighters. Deliveries will begin late this year. Addditional 200 planes will be produced in Germany by the Sud-Gruppe which includes Dornier, Messerschmitt, and Heinkel. F-104 production at Lockheed's Burbank and Palmdale facilities will extend into 1962. A $15 million modernization program is under way at Palmdale and at the Air Materiel Command depot in Sacramento. New German order and the modernization program will cushion the employment problem at Palmdale and Burbank, according to company officials, but will result in no extensive rehiring.

More Space for POP Rivets

United Shoe Machinery Corp's POP Rivet Division has moved from West Medway, Mass, to a new 140,000 sq-ft (manufacturing space) facility in Shelton, Conn. More room for production was a prime reason for relocation. Last year POP sales increased 80% over 1957.

Martin Co, Baltimore . . .

. . . has a $2.4 million contract for expansion of its TM-76B Mace Missile program.

Penn State Schedules Plastics Seminar

Summer seminar on "Plastics — Its Mechanical Properties, Design and Applications" will be held from June 29 to July 3 at Penn State, University Park, Penna. Purpose is to present to design, material, and research engineers a complete picture of plas-

"No, I didn't get the raise, but I'd better start packing."

AUTOMATIC ASSEMBLY

IS FAST,

ECONOMICAL,

TROUBLE-FREE

with Milford tubular rivets and automatic riveters

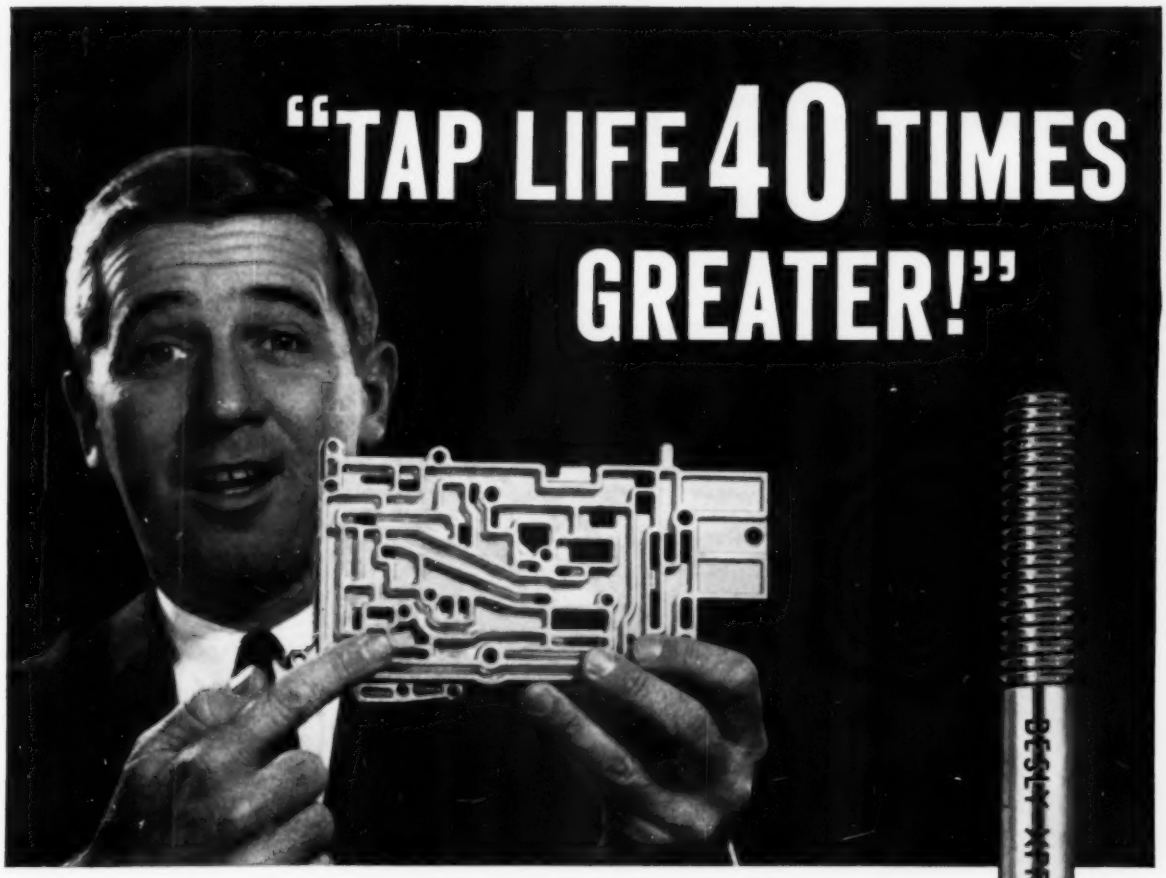
Mass production and automatic assembly cut costs only when all operations are trouble-free. That's why the high strength and uniform quality of Milford Tubular Rivets, plus Milford's wide line of precision riveters, are playing an active role in slashing today's production costs.

For the answers to assembly problems . . . *get in touch with Milford first!*

THE MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNA.
ELYRIA, OHIO • AURORA, ILL. • NORWALK, CALIF.

"TAP LIFE 40 TIMES GREATER!"

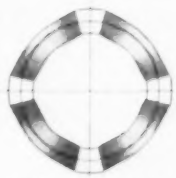


BESLY X-PRESS® TAPS—based on a new cold-forming principle—help boost production and cut downtime. A leading automotive transmission builder used to make this aluminum die cast transmission channel plate at an average rate of 1,000 to 1,500 holes per tap. Eleven 10-24 through holes had to be tapped in each plate. Production was low due to excessive tool breakage and downtime.

When the transmission builder changed to Besly 10-24 B-4 X-Press Taps, they averaged 59,450 holes per tap. Tool life increased 40 to 1. Production went up. Tap breakage, tool costs, and downtime descended sharply.

UNIQUE CAM-RELIEF DESIGN with taper point enables X-Press Taps to excel conventional cutting taps for faster production and longer life. Chips eliminated because the X-Press Tap cold-forms internal threads without cutting. Breakage is less. More pieces are tapped per hour.

Besly X-Press Taps are ideal for either blind or through holes and are recommended for copper, brass, zinc, leaded steels, aluminum, lead, die castings, and other ductile metals.



Cross-section showing unique cam-relief design

Call your Besly distributor or write us today for new booklet containing complete data.

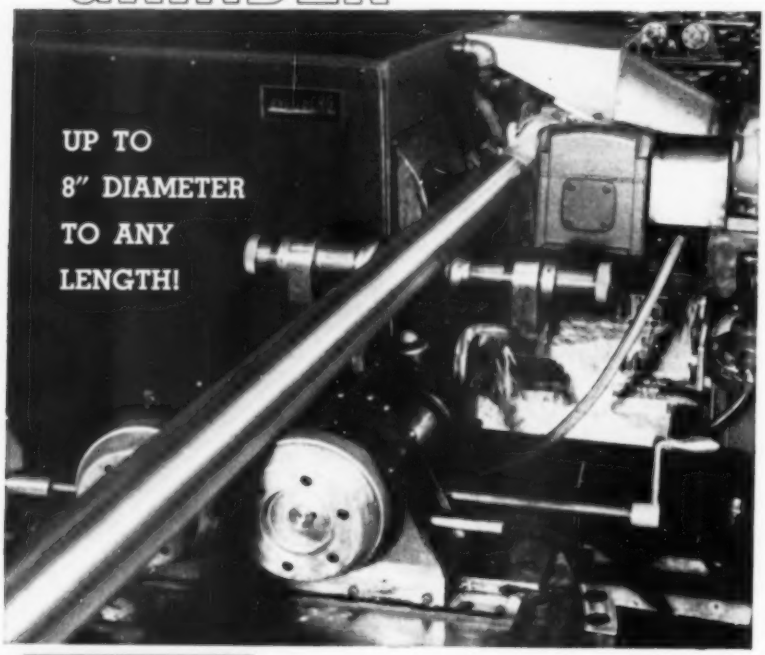
BESLY®

BESLY-WELLES CORPORATION

120 Dearborn Ave., South Beloit, Illinois

Grinders and Abrasives • Taps • X-Press Taps® • Drills • Reamers • End Mills • Tool Bits • Gages • Carbide Tipped Tools, Blanks, Lapped Toss-away Inserts and Holders

NEW HEAVY-DUTY CENTERLESS GRINDER



ENGELBERG 8132-HD

removes 3 lbs. metal per minute!

Loaded with "firsts," the Engelberg 8132-HD now makes possible exceptionally heavy single pass stock removal, extremely fine finishes, close tolerances on any rod or tube stock.

New large workpiece capacity—precision grinds and finishes any length, takes diameters from 1" to 8".

New powered outboard support system—main power unit controls synchronized "slave" units for variable through feed rates.

New automatic reverse feed—microswitch controls automatically change helix angle of outboard support power units and regulating wheel to reverse feed direction for multiple through feed passes; eliminates intermediate material handling.

New highs in production—Ex: 416 stainless steel bars 5.060" diameter, 20' length; removal .018" stock per pass at feed rate of 70" per minute. 1020 steel tubes 6¾" diameter, 10' length; removal .015" per pass at feed rate of 3' per minute.

Write today for new bulletin: **New Savings With Centerless Belt Grinding**

ENGELBERG, INC.

Precision **ABRASIVE MACHINE TOOLS**

108 SENECA STREET • SYRACUSE 4, N. Y.

CIRCLE 285 READER SERVICE CARD

Field Report . . .

tics engineering as well as to exchange information on new plastics, new techniques, and new applications. Dr L W Hu, associate professor of engineering mechanics, will coordinate the seminar which will be conducted on a lecture-discussion basis by specialists from industry and universities.

Royal Industries' Double Merger

Royal Industries, Inc, Alhambra, Calif, is acquiring Vard, Inc, Pasadena and Ideal-Aerosmith, Hawthorne. Merger, with Royal the surviving company, will establish the firm as a primary supplier of electromechanical devices. Royal's present products include jettisonable fuel tanks, special containers, vibration test equipment, machine control, and other electronic items. Vard produces high precision items for air frames, helicopters, and the nuclear engine industry. Ideal-Aerosmith makes special purpose valves, actuators, hydraulic filters, and test equipment.

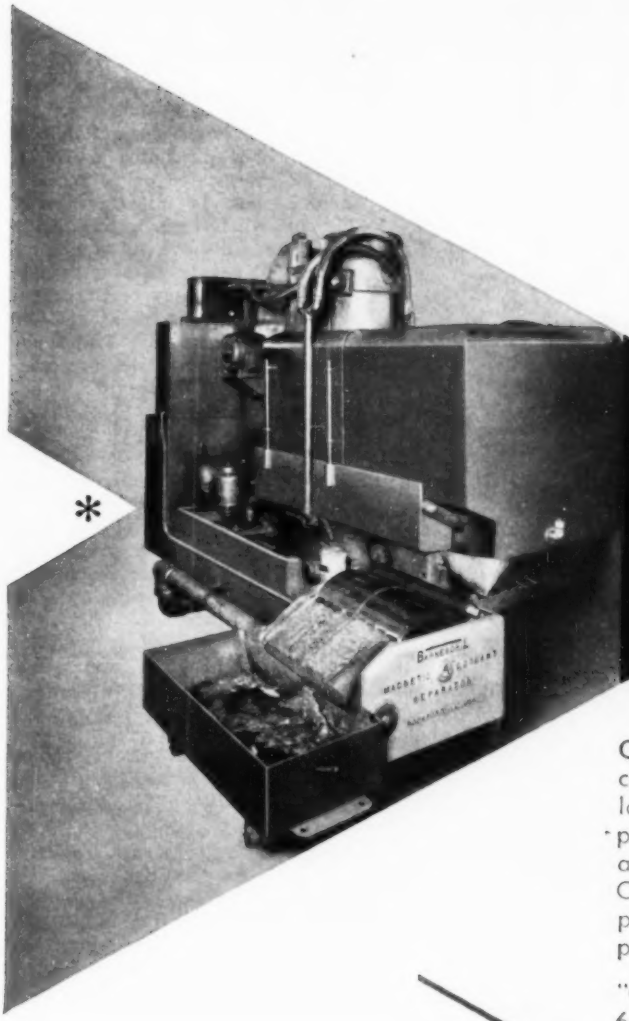
Launcher Order to ACF Unit

A $2.2 million follow-on contract for continued production of mobile launchers for the Northrop Snark SM-62 ICBM has been awarded by Northrop to the American Car and Foundry division of ACF Industries. Units will be made at the Berwick, Penna, plant.

I-T-E Circuit Breaker Co's . . .

. . . Special Products Division, Philadelphia, has a $1 million contract for 53 shipboard radar antenna systems. They'll be made for the Navy under subcontract from the Electronics Div of Westinghouse Electric.

"I don't mind him walking in his sleep, but he's empty!"



BARNESDRIL COOLANT CLEANING UNITS

CUT maintenance, labor costs

INCREASE PRODUCTION!

Coolant fed into a BarnesdriL magnetic coolant separator continuously circulates around the drum of powerful permanent Alnico magnets. Swarf, chips, and other ferrous particles are removed. Coolant is cleaned by the separator, thus preventing machine downtime and improving finishes.

a user reports:

"Our surface grinder (above) required 6 hours of cleaning and 5 gallons of coolant per week. With the BarnesdriL magnetic separator installed, there has been no downtime in 4 months and coolant used has dropped to 1 gallon per week. *We cut our grinding costs $65.50 per week.* Paid for the installation in less than 2 months."

These savings are typical. Call your BarnesdriL Factory Representative today or write for Catalog 300.

*BarnesdriL Magnetic Separator #4 installed on a Blanchard No. 18 Surface Grinder.

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS

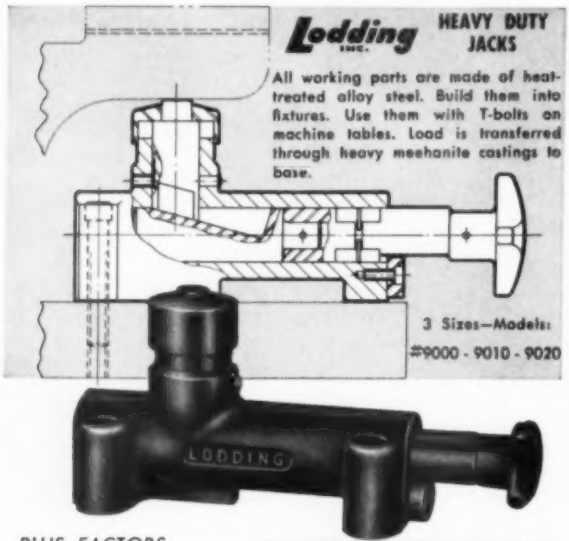
DETROIT OFFICE: 13121 Puritan Avenue

PREFERRED

because it

...SAVES MONEY
...SAVES TIME

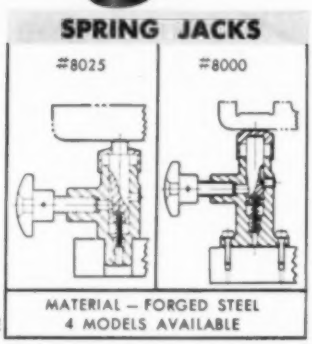
The acknowledged leader in its field, LODDING appreciates the recognition and commendation it has received from the nation's outstanding tool engineers.


Lodding INC.
HEAVY DUTY JACKS
All working parts are made of heat-treated alloy steel. Build them into fixtures. Use them with T-bolts on machine tables. Load is transferred through heavy meehanite castings to base.
3 Sizes—Models:
#9000 - 9010 - 9020
LODDING

PLUS FACTORS

- ✓ Longer life
- ✓ Greater serviceability
- ✓ All moving parts are heat treated and ground
- ✓ Forged tool steel material

TRACING TEMPLATES AVAILABLE
For information write



Lodding INC.

AUBURN, MASSACHUSETTS

FACTORY WAREHOUSES

Precision Tool Sales 417 E. Florence Ave. Los Angeles 33, Calif. PLeasant 3-1553	Bagby Engineering Co. 1047 Forest Ave. Evanston, Ill. AMbassador 2-2273	Southern Tool Dist. Co. 54 11th St. No. East Atlanta 9, Ga. TRinity 5-7065

Field Report . . .

Burroughs Expanding in France

Expansion of manufacture of business machines in France is in the works at Burroughs Corp of Detroit. Company has purchased a 110,000 sq-ft factory located on 25 acres at Villers-Ecalles, 14 miles northwest of Rouen. When it gets into full operation, plant will have initial employment of 600 people working on fabrication and assembly of Burroughs Ten Key adding machines that will be distributed throughout France and international markets. Factory operations will begin by July 1.

Owners of Townsend Co . . .

. . . New Brighton, Penna, fastener producer, have accepted a cash offer from Textron, Inc, of Providence, RI, to acquire all Townsend assets. Company will be operated as a subsidiary of Textron which controls some 24 companies in diversified fields including metalworking. Townsend makes rivets, fasteners, and special cold formed parts.

Rocker Solenoid Acquires Waco

Operating assets of Waco, Inc, Santa Monica, have been bought by Rocker Solenoid Co, Wilmington, Calif, for an undisclosed sum of cash. Combination of the two facilities is expected to make Rocker one of the country's leading designers and manufacturers of precision solenoids and fractional hp motors.

". . . When you want a job checked out you know my name . . ."

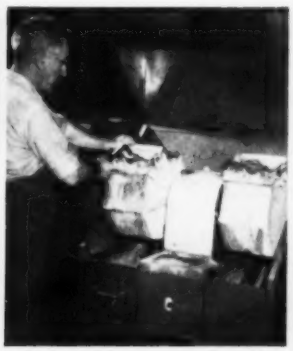
REPORT FROM WESTCLOX • *Division of General Time Corporation*

"Here's how we save $46,464 annually by deburring clock parts with ALMCO BARREL FINISHING EQUIPMENT."

"MY NAME IS A. R. BIERBRODT. Here at La Salle, Illinois, I'm Supt. of Metal Finishing for the Westclox Division of General Time Corporation, makers of the famous Big Ben alarm clocks. I'd like to show you how we save big money by using ALMCO barrel finishing machines for deburring and finishing 24 different clock parts in our plant."

(1) "Here, John Chambers lifts the hood of one of our 10 ALMCO machines. We figure we save $46,464 annually by deburring and finishing clock parts with ALMCO barrel finishing equipment."

(2) "Parts to be finished are added to predetermined proportions of media and compounds. A total of 10,000 cast gear wheels, for example, can be deburred and finished in one hour's time."



(3) "Lock 'er up and we're ready to go. Previously, when these clock parts were deburred and finished with power tools, only 3,500 parts were finished during an 8-hour work period."

(4) "A flip of the switch and the precision process begins. Burrs are removed, rough edges smoothed to specifications, and 80,000 perfectly finished parts delivered to production lines each day."

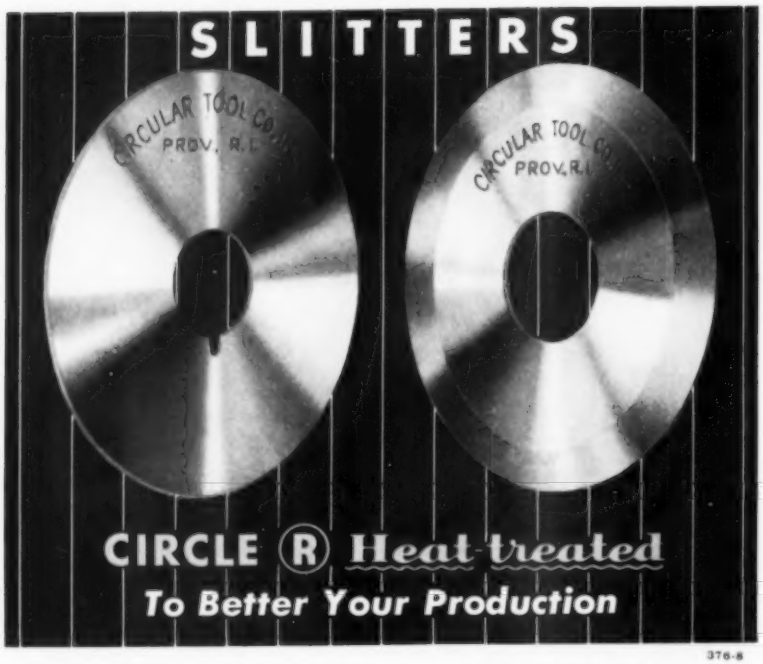
(5) "Here, Harry House, Foreman, inspects clock parts finished by ALMCO Supersheen equipment and methods. Barrel finishing has given us a daily labor saving of $193. What's more, quality and uniformity are good and production is way up. Results are truly outstanding."

LEARN HOW MODERN BARREL FINISHING can improve your product! The facilities of ALMCO's new technician-staffed lab in Albert Lea, Minnesota, are available to you without obligation. Send your sample parts with specifications desired or write on your company letterhead requesting an ALMCO engineer to visit your plant.

SEND FOR YOUR FREE barrel finishing handbook. 52 pages of case history facts and barrel finishing processes. Illustrated equipment section. Includes detailed cost chart on finishing of typical parts. Send for your free copy today!

ALMCO

Queen Products Division / King-Seeley Corporation
55 E. Main Street • Albert Lea, Minnesota
Sales Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven and Philadelphia.
IN ENGLAND: *Almco Division of Great Britain, Ltd., Hitchin, Herts, England.*



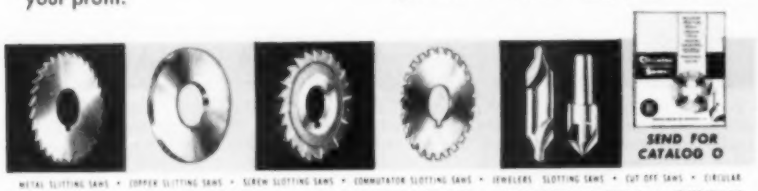
376-8

CIRCLE R Slitters are specialized tools, each designed for a specific job — including single or double bevel, square edge, etc., for slitting particular materials. And exclusive Circle R Heat Treating perfects them for your profit.

Consult these CIRCLE R Specialists...

BUSSAW — Production Mach. Sales, Inc.
CHICAGO — Ronald Robertson & Co.
CLEVELAND — Production Tool Co.
DAYTON — J. D. Harris Company
DETROIT — A. D. Spruce
HACKENSACK — The Eaton Company
INDIANAPOLIS — Walter F. Greene & Assoc.
MILWAUKEE — Ford Tool Co.
MONTREAL — Humphrey G. Morton
NEW YORK CITY — J. B. Commerford (Export)
PHILADELPHIA — General Tool Sales Co.
PHOENIX — 3-Dayette Tool Center
PITTSBURGH — Ralph Lipsette & Company
PROVIDENCE — Fred J. McMillan
ROCHESTER — Lesher D. Morton
ST. LOUIS — B. C. MacDonald & Co.
WESTBURY, L. I. — The Eaton Company

CIRCULAR TOOL CO., INC.
PROVIDENCE 5, RHODE ISLAND
Specialists in Circular Cutting Tools Since 1923



SEND FOR CATALOG O

METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS SLOTTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

CIRCLE 290 READER SERVICE CARD

BEVEL GEARS AND BEVEL PINIONS WITH LONG STEMS

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 ABRASIVE SURFACE GRINDERS —*Landis Tool Co, Waynesboro, Penna.* 8-page catalog CGS-59 describes and illustrates complete line. Sizes range from 6 x 18 in. to 12 x 30 in. for both hand-operated and hydraulic machines. Features covered, specifications tabulated.

2 INJECTION MOLDING MACHINES —*Hydraulic Press Mfg Co, Mount Gilead, Ohio.* 6-page bulletin 5831 discusses new design concept in preplasticizing of plastics material in injection molding. Machines and parts being molded are pictured. Complete specifications of five standard H-P-M preplasticizers up to 300-oz capacity with 1500-ton clamping pressure are covered.

3 MECHANICAL PRESS BRAKES — *Dreis & Krump Manufacturing Co, 7400 S Loomis Blvd, Chicago 36, Ill.* 8-page bulletin D-59 gives details on Series D Chicago press brakes. Illustrates and describes features, gives specifications of the 40 standard sizes in the series with capacities from 90 to 500 tons.

4 TRACING ATTACHMENT FOR MILLING APPLICATIONS — *Trace-Trave Sales Corp, 9830 Rush St, El Monte, Calif.* 6-page bulletin STM-1 describes cost saving features of SynchroTrace, a fully automatic 3D programmed control system. These include uniform feed rate, even on 90° walls; pick in either direction, and reduced benching time. Applications on milling machines ranging from small toolroom units to large planer mills are illustrated.

5 AUTOMATIC ROLL FEEDS — *Durant Tool Supply Co, Providence, RI.* 4-page illustrated bulletin describes features of line; feeds within thousandths with either friction clutch or Select-O-Matic indexer. Extra accessories covered include two-piece adjustable eccentric, adjustable mounting brackets, vernier adjustment attachment.

6 AUTOMATIC POINT POSITIONING CONTROL SYSTEM—*Electronic Control Systems, Division of Stromberg-Carlson, 1400 N Goodman Ave, Rochester 3, NY.* 12-page bulletin contains detailed information on Digimatic Model 202 that provides automatic point positioning of the work in two axes by means of a compound servo-driven table. X and Y coordinate data

(Continued on p 181)

"That isn't the way we advance here, Hughes!"

From HANNIFIN...

unit construction

to give you air valves

that do more jobs

Hannifin ⅜" four-way valve with "universal" base and new Speed Control section. Single-solenoid actuated. 10 other actuators available.

Hannifin's exclusive "spool-poppet" seals bubble-tight at either end of its short stroke.

For complete J.I.C. compliance, valve is electrically inoperative until dust-tight, splashproof solenoid cover is replaced and fastened tightly. Result: no more clogged, jammed solenoids.

One of the versatile—and most popular—Hannifin air control valves is this "CC" series, single-solenoid model. It is available for either ¼" or ⅜" air lines and is gasket-mounted to its own base. This particular base (one of three choices offered) can either be O-ring gasketed to your manifold or mounted over an opening in your bracket or machine. It will receive all four lines from below or take the inlet line from below and the two cylinder lines out one side. Or, you can make all connections at the sides.

When it comes to actuation, Hannifin offers an even wider selection: hand, foot, cam, pressure, single or double solenoid.

When necessary, you can remove this entire valve from its base without disconnecting air lines. Or, the exclusive "spool-poppet" can be replaced without even breaking electrical connections.

The "CC" series, like all Hannifin valves, is designed with "full flow" internal passages as large or larger than its rated pipe size.

You will find these and most other Hannifin valves described in Hannifin's new "Valve Finder." Get your copy from your Hannifin man, listed in the A-Z volume of Thomas' Register, or write:

HANNIFIN COMPANY

525 South Wolf Road • Des Plaines, Illinois

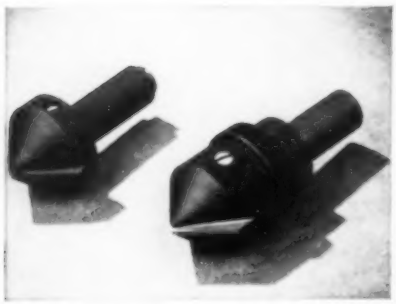
INGENIOUS NEW... UNIVERSAL R&R DEBURRING TOOL

with spring loaded retractable blade

eliminates chatter

gives precision-cut edge or

chamfer at high speed



The cutting action of Model 955 Universal R&R chatterless Deburring Tool (on the left) is affected by spring tension against the blade. On Model 956, right, the spring tension is against the body. This is adjustable to regulate the depth of cut. The blade is free-floating to allow self-alignment and uniform stock removal.

The new Universal R&R Tool makes a handy horizontal deburrer when used with a portable drill held in a vise. With proper adjustment, the R&R Deburring Tool is CHATTERLESS. A new design allows the bearing angle of the tool body and the blade to be in continuous contact with the work piece at all times.

R&R Deburring Tool used in electric drill as a portable unit for heavy plate or other objects too heavy to handle. Blades of the R&R Deburring Tool are replaceable at nominal cost from stock. They are made of high speed steel, precision hardened and ground to close tolerances for interchangeability.

Used in any standard drill press at the high operating speeds recommended by the makers of high speed steels, the R&R Deburring Tool performs most efficiently. High operating speeds mean more production, lower costs. Each tool is made in a full range of sizes to 1½" diameter.

UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 1, MICHIGAN

209

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

is stored on standard 1-in. punched tape. Especially suitable for short runs, it is adaptable to any present point positioning type of machine tool—drill, riveting machine, welder. Components illustrated and described include keyboard, control unit with tape reader, and compound servo table. Specifications tabulated.

7 HOBBING MACHINE — *Lees-Bradner Co, Cleveland, Ohio.* 10-page brochure gives data on British-built Dowding & Doll V.4 for production of smaller gears. Optional equipment includes a cam-operated automatic plunge feed that provides fast approach and automatic return of the work table for loading and unloading, and also permits precise control of the depth of cut for repetitive production of worm wheels and spurs of narrow face width.

8 JIG BORING AND JIG GRINDING MACHINES—*Carl Hirschmann Co, 30 Park Ave, Manhasset, LI, NY.* 15-page catalog illustrates and describes Hauser line. Specifications listed for 13 types of jig boring and jig grinding machines, 6 types of pivot polishing machines, and 6 types of optical checking and measuring apparatus. Special section covers attachments and accessories.

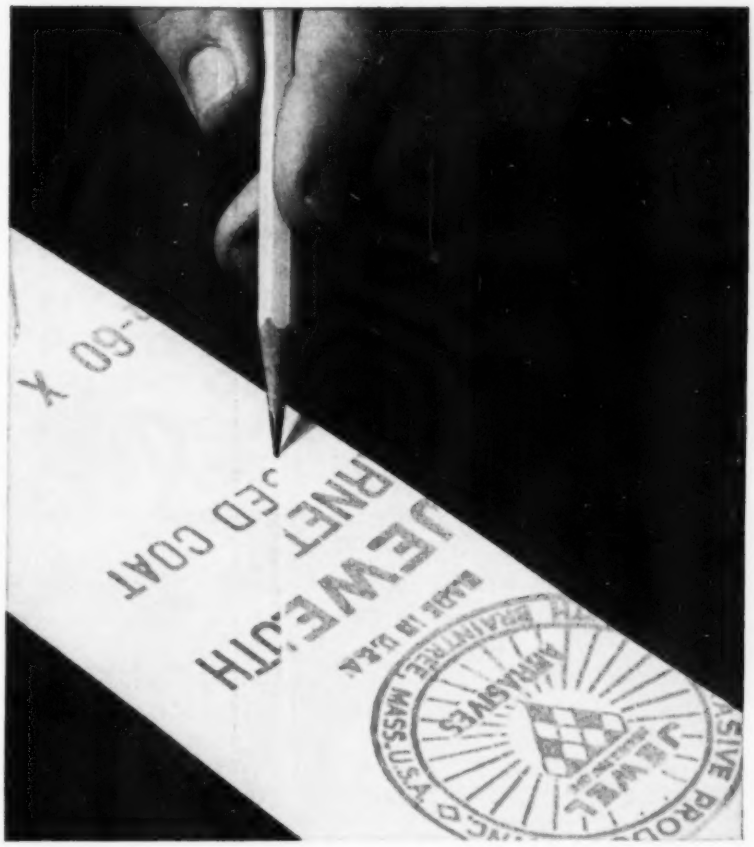
9 MILLING MACHINES—*Famco Machine Co, 3100 Sheridan Rd, Kenosha, Wis.* Illustrated bulletin describes Famco mills with three directional power feed. The 100 Model (1½ hp) and the 200 Model (2 hp) now incorporate motorized power feed to the knee as well as to table and saddle.

TOOLS AND ACCESSORIES

10 "CEMENTED CARBIDES FOR INDUSTRY"—*Allegheny Ludlum Steel Corp, Carmet Division, Oliver Bldg, Pittsburgh 22, Penna.* Revised 32-page catalog includes new and additional information on brazed tools, carbide inserts, toolholders, and blanks. Reduced prices announced on virtually all of Carmet's steel cutting grades including CA-605, CA-606, CA-608, and CA-610. Two new styles have been added to the indexable insert line, and a new line offering a heavy-cut chipbreaker is now available.

11 INDEXABLE INSERT MILLING CUTTERS—*Viking Tool Co, 1000 Nichols Rd, PO Box 471, Shelton, Conn.* 8-page catalog 591 pictures and describes complete line of throwaway insert blade face mills and end mills. Covers cutters with

(Continued on p 184)



How to make both ends meet . . . and still cut finishing costs!

Time was when abrasive belt joints raised a rough problem in finishing circles. The early overlapping joints caused belts to rotate unevenly, chatter and mar freshly finished surfaces. Not so now! Today, Jewel Brand "Velvet Joints" have put the "smooth" back in smoothing operations. Jewel Brand Belt ends are neatly blended to form velvet smooth joints which permit an even flow of cutting surfaces and eliminate jumping. The result is a smooth, uninterrupted action that speeds up grinding, finishing and polishing . . . helps keep product finishing costs in line. A Jewel Brand Engineer will be glad to demonstrate these superior belts in action in your plant without obligation. Arrange for a free demonstration now. Write Abrasive Products, Inc., **561** Pearl Street, South Braintree 85, Massachusetts.

belts
rolls
sheets
discs
specialties

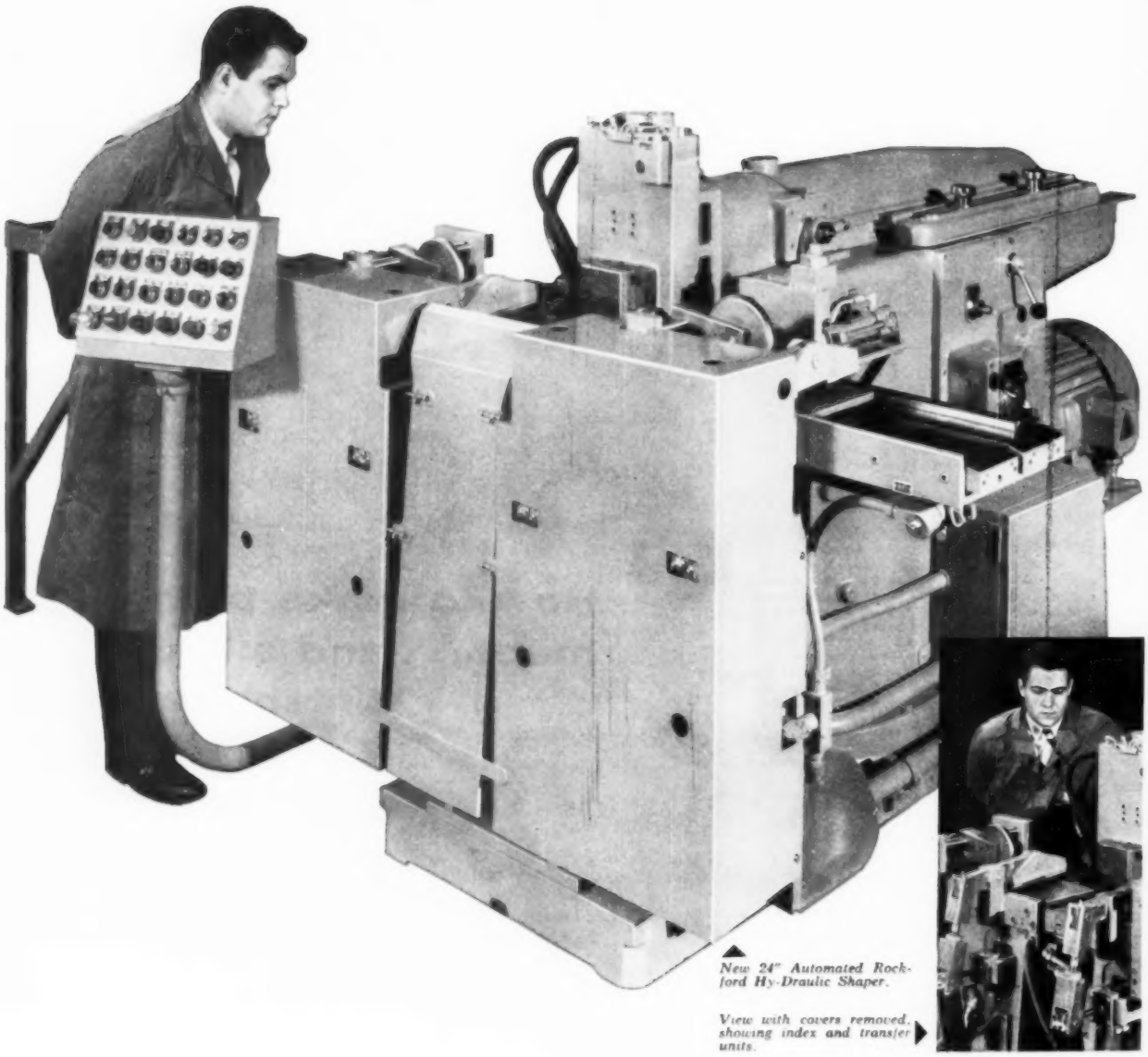
JEWEL BRAND

COATED ABRASIVES

ABRASIVE PRODUCTS, INC., South Braintree 85, Massachusetts

CIRCLE 294 READER SERVICE CARD

Now... automation ***comes to shaping!***



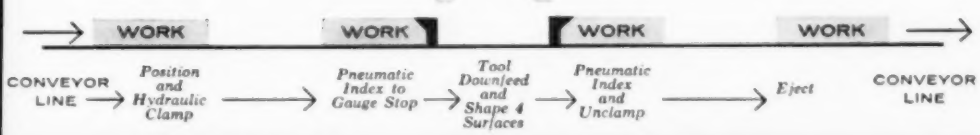
New 24" Automated Rockford Hy-Draulic Shaper.

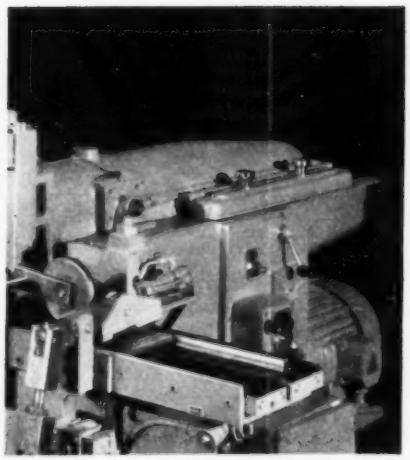
View with covers removed, showing index and transfer units.

COMPLETE AUTOMATIC CYCLING ON ROCKFORD

HY-DRAULIC SHAPER PRODUCES CONTINUOUS FLOW OF PARTS FOR CONVEYOR-LINE PRODUCTION . . .

4 TOOLS MACHINE LEADING AND TRAILING EDGES SIMULTANEOUSLY





Believed to be the first automatic shaper built, this standard 24" shaper with special tool head and cross-rail has been adapted to conveyor-line operation by arranging completely automatic cycling, including loading and unloading.

With this new method, many types of flat plates may be machined accurately and efficiently at high production rates, saving costly cutting tools and extra fixturing expense.

Four standard high speed steel tool bits with identical grinds are used to finish one vertical and one angular surface of each of 2 pieces simultaneously, as shown in diagramatic sketch of the automatic cycle. The machine feafures pneumatic index, hydraulic positioning and clamping, and positive mechanical feed. Operation is continuous until machine is stopped by operator, or automatic safety devices reject the cycle sequence.

This type of automatic machining has many variations, using Rockford Hy-Draulic Shapers. If you have high output requirements for work which lends itself to this type of machining, send us blueprints for estimates and recommendations.

h HYDRAULIC

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

CIRCLE 296 READER SERVICE CARD

FEEDCISION

INCREASES CENTERLESS GRINDING PRODUCTION

200%

YES

300%

With This New Automatic Infeed Grinding Attachment

Utmost precision in grinding and duplicate sizing. Sizing dial is graduated in (.00001) one hundredth of a thousandth of an inch. No hydraulic checking cylinder to change feed rate when oil is cold. No checking of oil level or refilling of hydraulic checking cylinder. Three (3) different feed rates are available in one unit for the fastest, most efficient, and precise sizing in a centerless grinder.

CAN BE USED FOR TRU-FEED AS WELL AS INFEED for close sizing. Ideally located push button control station consists of Stop-Button, Caution Pilot Light, and a selector switch for set up or auto grinding positions. **CATALOG** — Write for it today!

MODERN DEVICES

Subsidiary of

TWENTIETH CENTURY MFG. CO.

Box 429 A Libertyville, Illinois

Open Territories for Manufacturers' Representatives

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

negative and positive rake angles, square shoulder and 45° lead angles, carbide and HSS indexable blades, 3-dimensional assembly views, chip flow diagrams, and cutting force sketches.

12 CONTINUOUS GRINDING GAGES —*Federal Products Corp, 1144 Eddy St, Providence 1, RI.* 16-page catalog 59A on Arnold gages features three new items: a miniature OD grinding gage for diameters below ½ in.; a king-size OD gage for diameters over 20 in.; and a gage for continuously measuring ID's while grinding.

13 TOOL TEMPLET SET—*PIC Design Corp, 477 Atlantic Ave, East Rockaway, LI, NY.* Set, consisting of three tracing templets of tool clamps and associated components, is available to assist in the design and development of test fixtures, milling fixtures, jig components, and other tool engineering applications.

14 DIAMOND DRESSING TOOLS — *Permattach Diamond Tool Co, Division of Hitchiner Manufacturing Co, Milford, NH.* 4-page bulletin contains information on standard line plus availability of specials. All basic dressing tool types are outlined and particular uses of each type described.

15 X-RAY SPECTROGRAPH — *Philips Electronics, Inc, Instruments Div, 750 S Fulton Ave, Mount Vernon, NY.* 8-page booklet provides information on the Norelco Autrometer, an automatic indexing instrument which employs a universal detector and automatic crystal changer to provide a fast, non-destructive analysis method for as many as 24 elements in a single sample. Covers applications, operating principles and procedures, performance, calibration, reproducibility, automatic programming, and statistical accuracy.

16 MINERAL OIL—*L Sonneborn Sons, Inc, 300 Fourth Ave, New York 10, NY.* Bulletin designated Technical Data File F-16 presents data on special white mineral oils for hydraulics and recoil mechanisms. Oil, known as Klearol, functions as a hydraulic fluid and recoil oil.

17 DIFFERENTIAL PRESSURE INDICATORS—*Aircraft Porous Media, Inc, 80 Sea Cliff Ave, Glen Cove, NY.* Bulletin A-109 describes Deltadyne, a small device weighing 0.27 lbs, for use in −65 to +275 F systems up to 5000 psi, that indicates by a pop-up red button when the differential pressure exceeds a stated value, normally in the 5 to 100 psi range.

18 ANGLE ATTACHMENTS FOR POWER HAND TOOLS—*Monument Engineering Co, Drexler Division, 1825 Bellefontaine St, Indianapolis, Ind.* Catalog describes attachments which permit "around-the-corner" precision drilling, burring, rotary filing, grinding, polishing, high-speed nut setting, and screw driving at 45°, 90°, or inverted 45° angles. Includes specifications for both production and maintenance type units, for attachments with capacities up to 7000 rpm, and a complete range of both output shafts and driving sources.

19 WHEEL DRESSERS—*J & S Tool Co, 87 Dorsa Ave, Livingston, NJ.* 8-page folder describes complete line of Fluidmotion units that dress two angles tangent to a radius in one continuous motion with 0.0001 in. accuracy.

HEAT TREATING AND WELDING

20 WELDING POSITIONERS — *Harnischfeger Corp, Milwaukee, Wis.* 16-page booklet on P&H welding positioners illustrates and describes nine heavy-duty models ranging from 3000 to 100,000-lb capacity. New features and accessories covered.

21 HEAT TRANSFER UNIT—*Tranter Manufacturing, Inc, Platecoil Division, Lansing 9, Mich.* 8-page bulletin PD-1 on new Multi-Zone Platecoil unit pictures and explains applications such as tank and process heating and cooling, heat recovery, and oven and furnace applications. Contains complete dimensional data for standard styles and sizes, as well as examples of specially designed equipment.

22 NICROBRAZ VAPO-FLUX — *Wall Colmonoy Corp, Stainless Processing Division, 19345 John R St, Detroit 3, Mich.* Engineering data sheet No. 2.2.3 discusses material available as liquid or powder which produces good wetting and flow of brazing alloys in marginal or poor dry hydrogen atmospheres. Covers properties, uses, and methods of applying to aid in brazing in pure hydrogen or inert atmospheres.

PLANT SERVICE EQUIPMENT

23 LODESTAR ELECTRIC HOISTS — *Chisholm-Moore Hoist Div, Tonawanda, NY.* 12-page bulletin 158-G gives details on complete line including three new larger capacity and higher speed models. Units are now available in capacities from ⅛ to 2 tons and from 8 to 60 fpm lifting speeds.

24 ALUMINUM FINISHING MANUAL —*Frederick Gumm Chemical Co, 538 Forest St, Kearny, NJ.* 15-page manual contains general discussion of aluminum alloys, treatment processes for wrought and cast aluminum, and detailed information on CLEPO compounds together with operating data.

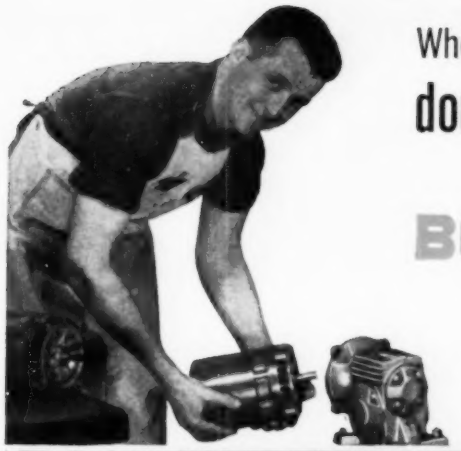
25 DUST COLLECTOR—*American Air Filter Co, 215 Central Ave, Louisville, Ky.* 20-page bulletin 272-B presents information on the Type D-Roto-Clone designed for collecting moderate loadings of dry granular particles. Covers applications, principle, installation, and arrangements. Accessories illustrated; charts and graphs give performance characteristics, capacity tables, general air engineering data.

26 AUTOMATIC METERING PUMP—*Lapp Insulator Co, Process Equipment Division, 102 Hall St, LeRoy, NY.* Illustrated bulletin 500-A describes Microflo Auto-Pneumatic Pulsfeeder, a controlled volume pump that meters fluids at micro flow rates in response to automatic signals from pneumatic control instruments. Operating pressures up to 2000 psig are acceptable.

27 EMERGENCY LIGHTING—*Electric Cord Co, 21 Spruce St, New York 38, NY.* 8-page catalog 12 pictures and describes Light Warden Chargomatic auto-

(Continued on p 188)

"Fool around, and you'll all be late!"



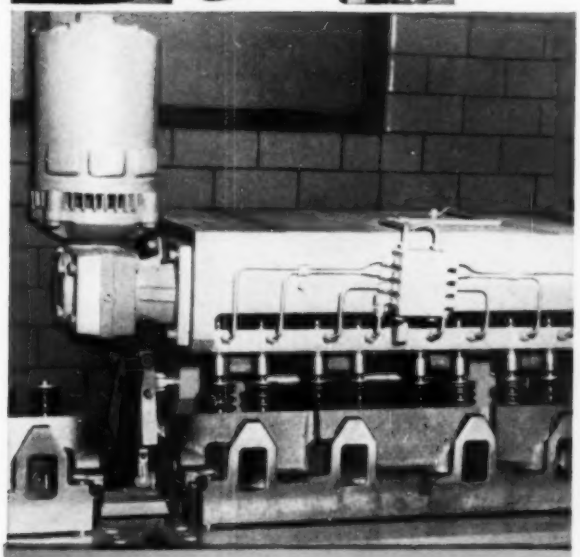
Where continuous automatic operations demand

double insurance against downtime

the leading choice is standardized

BOSTON Gear® SPEED REDUCERS

NO DOWNTIME for motor repairs. The standard end-mounted motor on BOSTON Gear RATIOMOTORS is easily detached by removing the bolts holding the motor to the gear unit flange. A spare motor can be attached, and operations resumed in a few *minutes*. Gear unit remains undisturbed, preserving alignment.



BOSTON Gear Vertical Right Angle RATIOMOTOR drives the valve "popping" (final test) unit in a giant 29-station transfer machine for continuous automatic assembly of cylinder heads.

BOSTON Gear Horizontal Right Angle RATIOMOTORS drive magnetic belts which convey parts from lower storage bins to vibratory hoppers at start of 13-station, automatic assembly of roller skate wheels.

BOSTON Gear RATIOMOTORS are the leading choice for all types of installations where downtime would be disastrous to production schedules. One reason is BOSTON Gear quality standards, which assure highest efficiency and extra service life of the gear unit. Another is BOSTON Gear design leadership like the detachable motor which permits continued operation with a spare, avoids downtime. Design around BOSTON Gear RATIOMOTORS for this *double* insurance against downtime. All types and ratios are *standardized stock* models, quickly available anywhere from over 100 BOSTON Gear Distributors. Boston Gear Works, 60 Hayward Street, Quincy 71, Massachusetts.

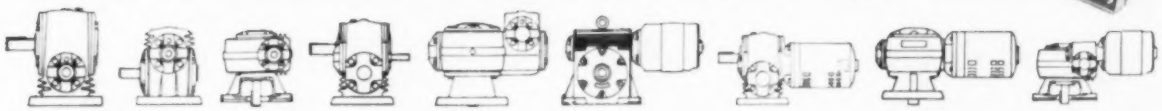
Advt. copyright by Boston Gear Works

From Stock!

AT YOUR NEARBY BOSTON Gear DISTRIBUTOR

— STANDARDIZATION PAYS —®

REDUCTORS — RATIOMOTORS — FLANGED REDUCTORS — Catalog lists 1605 types and ratios

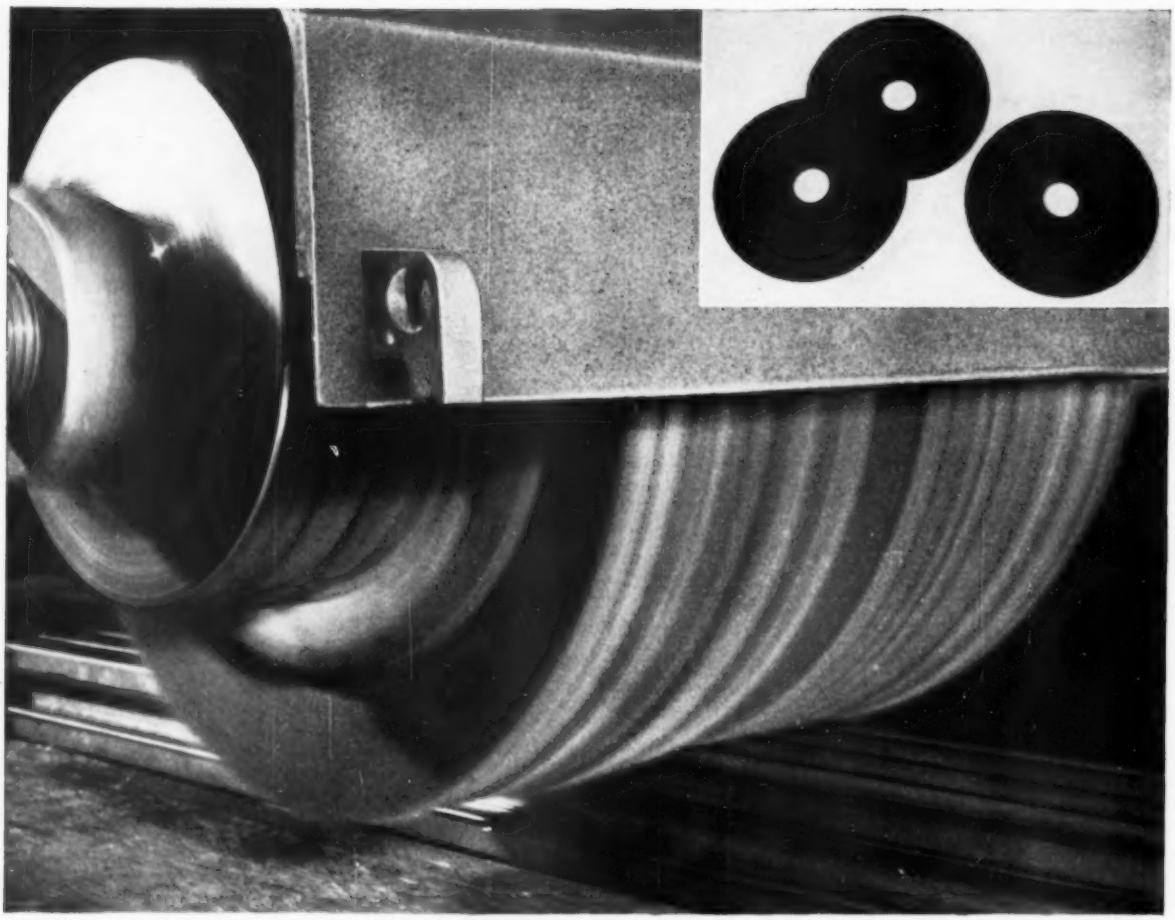


3M announces the first really new

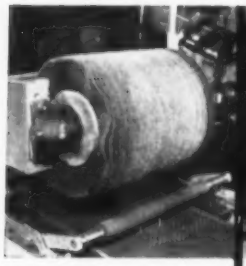
REG. U.S. PAT. OFF.

NEW "SCOTCH-BRITE"

BRAND



You are equipped to use "SCOTCH-BRITE" Now! No expensive production conversions necessary . . . "SCOTCH-BRITE" adapts to most hand, bench and production line machinery!

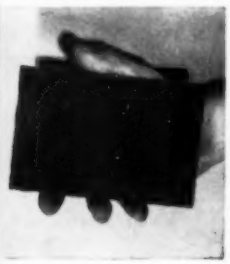


"SCOTCH-BRITE" sections mounted on conveyorized machine for flat work.

"SCOTCH-BRITE" sections on standard bench grinder for off-hand finishing.

"SCOTCH-BRITE" sections mounted on flexible shaft for blending.

"SCOTCH-BRITE" sections on floor lathe for production line use.



"SCOTCH-BRITE" pad cut from larger piece, used for hand touch-up work.

concept in finishing since 1921!

Finishing Material

...for stainless steel, aluminum, brass, copper, bronze, titanium, alloys...

"SCOTCH-BRITE" BRAND Finishing Material is a newly developed tough Nylon web, impregnated with microscopic working particles—the first major advance in metals finishing since 1921 when 3M introduced a coated abrasive that could be used either wet or dry.

Another product in the "SCOTCH-BRITE" family, introduced in February, 1958, has already revolutionized floor maintenance through amazing cost savings.

This amazing new "SCOTCH-BRITE" Material can be used in metal blending, cleaning, or finishing operations to obtain finer finishes; greater surface uniformity; and for correcting surface imperfections.

It gives a consistent finish from beginning to end of a run; mill-applied finishes obtained with "SCOTCH-BRITE" can easily be duplicated or matched by the fabricator.

"SCOTCH-BRITE" BRAND Finishing Material is lightweight, flexible, and can be formed to meet every need. It is available in different grades, and in a range of sizes in sheet, roll, and section forms. It will fit all existing mechanical equipment. Material is approximately ¼" thick; five to eight sections make up 1" of wheel width. Because of its extreme lightness, only ¼ h.p. per inch of wheel width is needed to drive. And greatest effectiveness is achieved with very light pressure—the material does the work!

"SCOTCH-BRITE" Finishing Material is completely unlike any other metal-finishing material you have ever seen—*and so are the results!* It gives the fastest, easiest, lowest cost satin-like finish of any method known . . . opens up new possibilities for a wide variety of new finishes for every kind of metal. And "SCOTCH-BRITE" allows finer finishes on thinner metal because it finishes *cool*—no discoloring; no distorting. Actual stock removal is so negligible as to be almost immeasurable!

Ask for FREE DEMONSTRATION!

"SCOTCH-BRITE" Brand Finishing Material is so totally different from any other, that the only way to judge it is by seeing it in action on your own production. We'll be glad to arrange a demonstration, with a competent technical advisor, at your convenience. Just use the coupon or write on your letterhead.

Minnesota Mining and Manufacturing Co., Dept. AK-59
900 Bush Ave., St. Paul 6, Minn.

Please call to arrange a demonstration of your new "SCOTCH-BRITE" Finishing Material.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

"SCOTCH-BRITE" IS A REGISTERED TRADEMARK OF THE 3M CO., 900 BUSH AVE., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 16. CANADA: LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

Mine too...

That's right, Lois. Mom says Dad told her that he and your Dad decided to quit trying to make gears for their machines . . . better to buy them from a gear maker. Now he's not glowering around, mumbling about "costs" anymore. Let's send that CINCINNATI man a really cool record album!

CINCINNATI gears cut your costs ALL the way—
Precision inspection saves your in-plant checking costs . . . Guaranteed delivery dates cut production delays . . . Consistent quality reduces assembly costs . . . High machine utilization means lower gear prices to you.
Send prints for quotation on your gears and custom gear boxes.

CINTI®

THE CINCINNATI GEAR CO.

Wooster Pike and Mariemont Ave. Cincinnati 27, Ohio
Custom Gear Makers Since 1907

GEARS, good gears only

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

matic units. Specifications and prices given for a variety of models for a range of applications.

28 PORTABLE ELEVATORS FOR MATERIAL HANDLING — *Association of Lift Truck and Portable Elevator Manufacturers, One Gateway Center, Pittsburgh 22, Penna.* 20-page booklet is an industry-sponsored basic reference guide that presents in detail exactly what the portable elevator is and illustrates its advantages and applications for vertical material handling. Various types discussed, pointers on selection included.

29 GUIDE TO FIRE EXTINGUISHERS —*Ansul Chemical Co, Fire Equipment Division, Marinette, Wis.* 6-page folder contains a table which compares characteristics of various types; bar graph shows comparative effectiveness of extinguishing agents according to Underwriters' Laboratory ratings.

30 MATERIALS HANDLING EQUIPMENT—*Prab Conveyors, Inc, 30121 Groesbeck Hwy, Roseville, Mich.* 47-page catalog 600 illustrates and describes standard and custom-built equipment including Magnavators, Tube-Veyors, Chip-A-Way, Welded Tube; parts feeders, vibrators and vibrating conveyors; bucket elevators, flux and chip handling systems.

PARTS AND MATERIALS

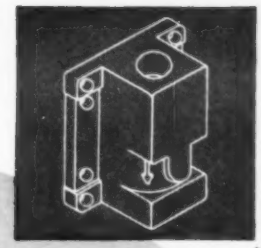
31 ELECTRO-SHEAVES—*Warner Electric Brake & Clutch Co, Beloit, Wis.* 10-page brochure WEB P-52 describes in detail a new clutch-pulley package for direct installation on standard electric motors from 1 to 25 hp. Operation, dimensions, selection data included.

32 NYLON STOCK SHAPES—*Polymer Corp of Pennsylvania, Reading, Penna.* 4-page bulletin on Nylatron GS (molybdenum disulphide filled) nylon shapes presents property advantages of the material used to expand the field of nylon in such applications as gears, rollers, bearings, washers, wear strips and pads, and other applications requiring long wear life and exceptional resistance to creep or cold flow. Physical property data and specific stock shape size availabilities included.

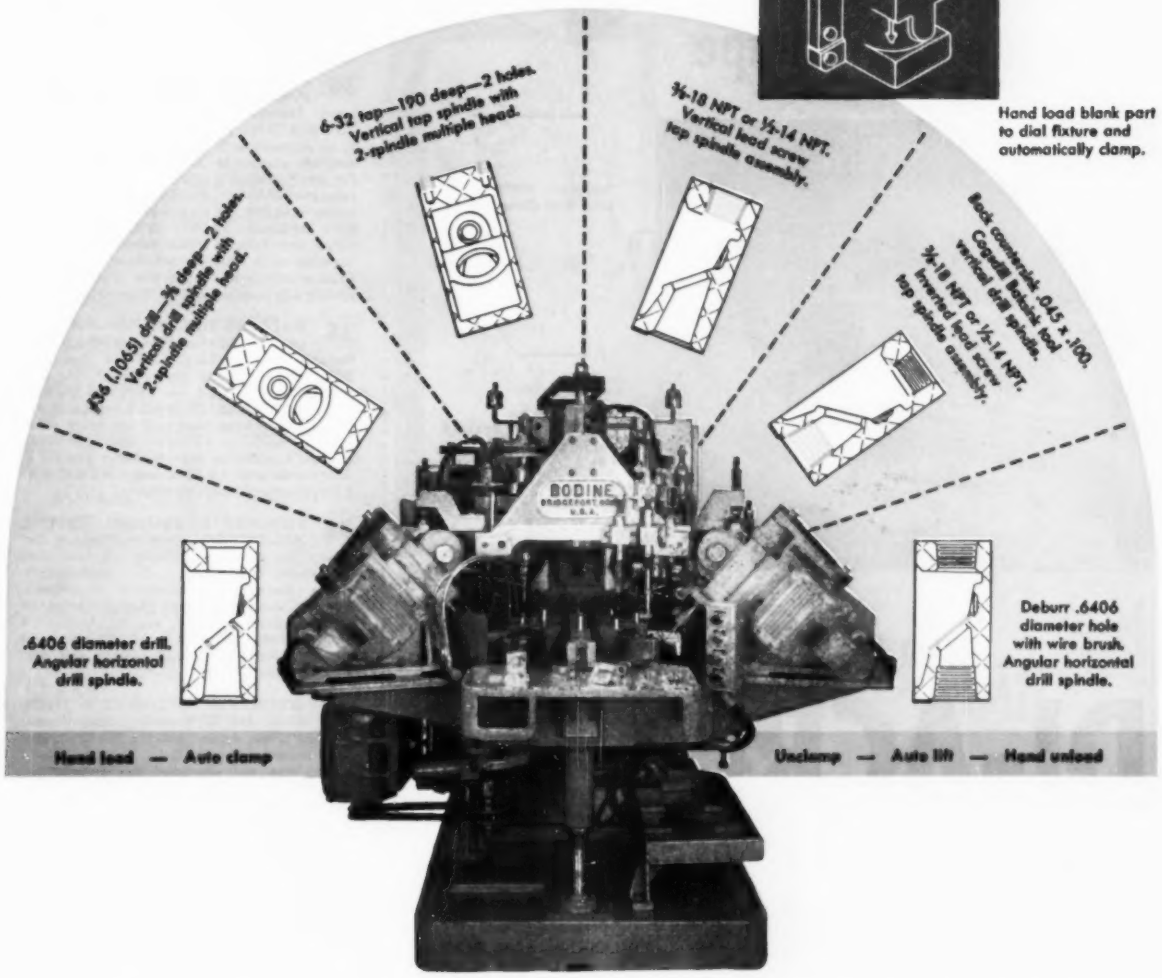
33 SINGLE-PHASE MOTORS—*Robbins & Myers, Inc, Motor Division, Springfield, Ohio.* 4-page illustrated bulletin 470-B gives data on expanded line of integral hp

"You and your full scale!"

Bodine case history no. 46



Hand load blank part to dial fixture and automatically clamp.


6-32 tap—190 deep—2 holes. Vertical tap spindle with 2-spindle multiple head.
#36 (.1065) drill—⅜ deep—2 holes. Vertical drill spindle with 2-spindle multiple head.
⅜-18 NPT or ½-14 NPT. Vertical lead screw tap spindle assembly.
Back countersink .045 x .100. Cogsdill Balanic tool. Vertical drill spindle.
⅜-18 NPT or ½-14 NPT. Inverted lead screw tap spindle assembly.
.6406 diameter drill. Angular horizontal drill spindle.
Deburr .6406 diameter hole with wire brush. Angular horizontal drill spindle.
Head load — Auto clamp
Unclamp — Auto lift — Hand unload
BODINE
BRIDGEPORT CONN. U.S.A.

Good way to hold a winning hand

in competitive manufacturing.

This major manufacturer of automatic control equipment has used cost-reducing Bodine Basic Machines and tooling methods for many years.

The interesting new Bodine unit shown above went in to replace another machine . . . to include MORE OPERATIONS, performed at a FASTER RATE.

The new machine features recently-developed Bodine reversing motor-driven lead screw spindles . . . one vertical and one inverted. The valuable versatility of Bodine tooling with combinations of vertical, angular and inverted spindles is clearly demonstrated.

This is also an example of how advanced Bodine tooling is constantly stepping ahead of production demands, even among present Bodine users. In all cases, such tooling is readily adapted to present Bodine Basic units, an important cost-advantage users of our equipment enjoy.

If you have a part you would like to produce better at lower cost, send us a sample and prints for analysis. No cost or obligation. Write Dept. AM-5.

1BD59

MATERIAL and PART: Zinc die-cast valve body.

PRODUCTION: 15 complete pieces per min.; 6000 operations per 50-min.hr.

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

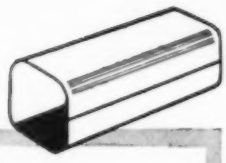
CIRCLE 302 READER SERVICE CARD

HOW TO form a rectangular shape

with the

DI-ACRO ROLLER

Forming small and large circles without flat spots and a variety of other sheet metal shapes is easily accomplished on the Di-Acro Roller with its *exclusive cam actuated Idler Roll.* Consult the yellow pages of your phone book under Machinery, Machine Tools for the name of your nearest Di-Acro distributor or write for Quick Facts Folder describing this and other Di-Acro Machines.



1 Introduce metal with Idler Roll disengaged.

2 Roll thru to desired point and engage Idler Roll.

3 Continue bend until angle is formed.

4 Disengage Idler Roll and roll to next point.

5 Engage Idler Roll to make second bend.

6 Repeat process until shape is formed.

pronounced die-ack-ro

di-acro PRECISION METALWORKING MACHINES

Find Us Fast in The Yellow Pages

O'NEIL-IRWIN MFG. CO.

405 Eighth Ave. Lake City, Minn.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

units available in ratings from ¾ to 20 hp, in open protected; totally enclosed, fan cooled; and explosion proof frames. Tabulated ratings, dimensions, and weights included.

34 SHEAR FASTENERS — *Standard Pressed Steel Co, Box 875, Jenkintown, Penna.* Two new bulletins (Forms 2477 and 2478) give data on fasteners said to be as much as 70% stronger than present aircraft standards. Offered in two series, for applications to 550 or to 900 F, shear strength options are the same in either series—132,000 psi or 156,000 psi. Material, heat treatment, finish, thread characteristics, and data on shear strength of bolts, together with ultimate tensile strength and fatigue strength of the nut and bolt assembly are summarized in table form.

35 SILICONE RUBBER—*General Electric Co, Silicone Products Dept, Waterford, NY.* Bulletin CDS-170 describes RTV (room temp vulcanizing) silicone rubber recommended for electrical potting and encapsulating, for flexible mold-making materials, and for high and low temp sealing and caulking. Contains complete product and application data for three new RTV compounds said to have improved physical properties and heat resistance.

36 PRIMARY ALUMINUM CASTING ALLOYS—*American Smelting & Refining Co, Federated Metals Division, 120 Broadway, New York 5, NY.* 8-page brochure discusses composition, properties, physical and mechanical characteristics of Revere alloys. Included are tabulations of the nominal composition of Revere sand casting, permanent mold casting and die-casting alloys.

37 HYDRAULIC CYLINDER — *Sheffer Corp, 328 W Wyoming Ave, Cincinnati 15, Ohio.* 4-page bulletin 159 illustrates and describes new 1¼-in. bore hydraulic clamp-type unit designed for automation, tooling, and production line applications. Designated the CLH Series, compact model is 1⅝ in. square and very short in overall length. Operating pressures are 1500 psi hydraulic and 250 psi air. Series is supplied in single or double acting types in 1, 2, and 3-in. strokes.

"Now I know why Mr. Ace said he couldn't wait till next month rolls around!"

DO WHAT OVER 450 OTHERS HAVE DONE!

Here are a few industries that checked and chose Ohio recently.

STEEL:
National Tube Division, U.S. Steel Corp., new plant at Lorain ($5,000,000).

PLASTICS:
Durez Plastics Company, new plant at Kenton ($5,000,000).

RUBBER:
Moulded Rubber Products, Vernay Laboratories at Yellow Springs ($750,000).

CEMENT:
Columbia-Southern Chemical Company, new plant at Barberton ($7,000,000).

GLASS:
Pittsburgh Plate Glass Company, new plant at Crestline ($2,000,000).

ALUMINUM:
Kaiser Aluminum, new plant at Belpre ($2,000,000).

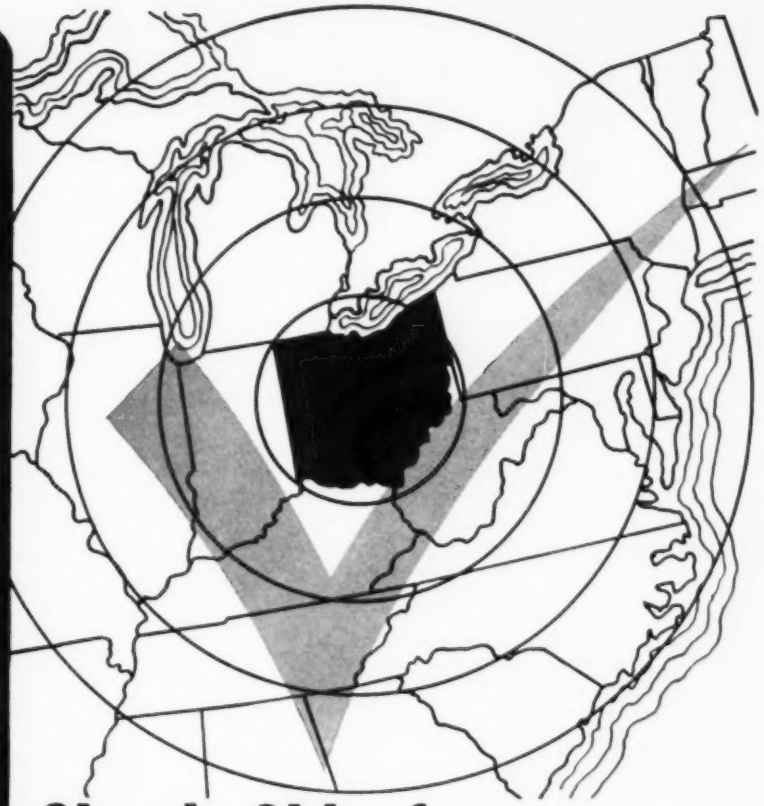
CHEMICALS:
Diamond Alkali Company, new research center at Painesville ($3,000,000).

AUTOMOTIVE:
Ford Motor Company, new plant at Lima ($13,000,000).

ELECTRONICS:
Bird Electronic Corporation, new plant at Solon ($150,000).

METAL FABRICATION:
Sunray Stove Co., new plant at Delaware ($1,500,000).

FOOD:
Campbell Soup Company, new plant at Napoleon ($7-10,000,000).



Check Ohio for your Industrial Growth

Want proof industry is booming in Ohio? More than 450 companies have invested over $450,000,000 in new plants and expansion during the last two years.

Ohio is now *the No. 2 state in value added by manufacture*, thanks to such advantages as: Central location . . . unsurpassed transportation . . . easy access to raw materials . . . vast pool of skilled labor . . . balanced economy favorable to business profit.

Ohio's state and local governments want and welcome new industries — large, medium and small.

Check Ohio in planning your company's future. It offers the best combination of *Markets, Materials, Men.*

For detailed information on available industrial sites or any aspect of plant location in Ohio, write or phone Division of Economic Development and Publicity, Ohio Department of Commerce, Columbus 15, Ohio.

If you're looking to the future . . . locate in OHIO

CIRCLE 304 READER SERVICE CARD

there'll never be a better time...

for you to call your distributor of Nicholson or Black Diamond blades. Ask him for a first order of the blades you regularly use.

You'll like them. Not that we promise miracles. We don't. But we do promise that you'll get as fine a blade as money can buy. And not much money at that, considering the way we make them. The Nicholson or Black Diamond trademark never goes on our blades until our inspectors are positive they deserve it. And they're hard to please.

A good many industrial blade buyers and users have been using our blades for nearly a year now. Best gauge of the way they like them is the way they keep reordering them. Isn't it time for you to call your Nicholson or Black Diamond blade distributor? Never be a better time.

If you use Ground Flat Stock—or could—your Nicholson or Black Diamond blade distributor can save you $ in this department, too. Ask him for details.

Industrial Distributors provide the finest goods and services in the least possible time. Our products are sold exclusively through them.

NICHOLSON

Nicholson File Company, Providence 1, Rhode Island

FILES • ROTARY BURS • HACKSAW AND BAND SAW BLADES
GROUND FLAT STOCK • INDUSTRIAL HAMMERS

Ralph E Price (left), vice president of Landis Tool Co, Waynesboro, Penna, has been elected executive vice president and assistant general manager. **William P Flohr** (center), formerly project engineer in charge of new developments, has been appointed chief engineer of the company. **Eugene R Fogt**, controller, is now assistant treasurer

NAMES IN THE NEWS...

James L Anast has been elected president of Lear, Inc, Santa Monica, Calif. He was previously a vice president and assistant to the president for technical planning. He succeeds **Richard M Mock**, chairman of the executive committee and president since 1948. **K Robert Hahn**, a vice president, has been elected executive vice president of the company.

John F Crowther has been elected vice president, manufacturing, for Turco Products, Inc, Los Angeles producer of industrial chemical processing compounds. He was formerly general manager of the Chem-Mill Division. **George H Fox Jr**, formerly sales manager of the division has been named manager of the new Chem-Mill and Coatings Division.

Galen Miller, vice president and treasurer of Towmotor Corp, Cleveland, has been elected executive vice president. **Richard S Wentz**, recently appointed factory manager, has been named a vice president.

Paul F Bruning has been appointed factory manager in charge of manufacturing at Vard, Inc, Pasadena subsidiary of Royal Industries, Los Angeles. Before joining Vard, Mr Bruning was vice president, manufacturing, at Holly-General, Pasadena heater manufacturer.

Robert G Carlson has been made manager of the Hi-Pressure Products Division of Sargeant & Wilbur, Inc, Pawtucket, RI, manufacturer of industrial heat treat equipment.

Edward D Rollert, general manager of General Motors' Harrison Radiator Division at Lockport, NY, has been appointed general manager of the Buick Division in Flint, Mich. He succeeds **Edward T Ragsdale**, 61-year-old Buick head, and a GM vice president, who is retiring under the company's retirement plan.

George H Fromer has been appointed vice president and general manager of Atlas Drop Forge Co, Lansing, Mich, subsidiary of Dana Corp of Toledo. Prior to joining Atlas, Mr Fromer was general manager of Taylor Forge & Pipe Works, Gary, Ind.

Roy R Brewton has been named vice president and controller of Convair Division of General Dynamics Corp. He has been controller since 1956.

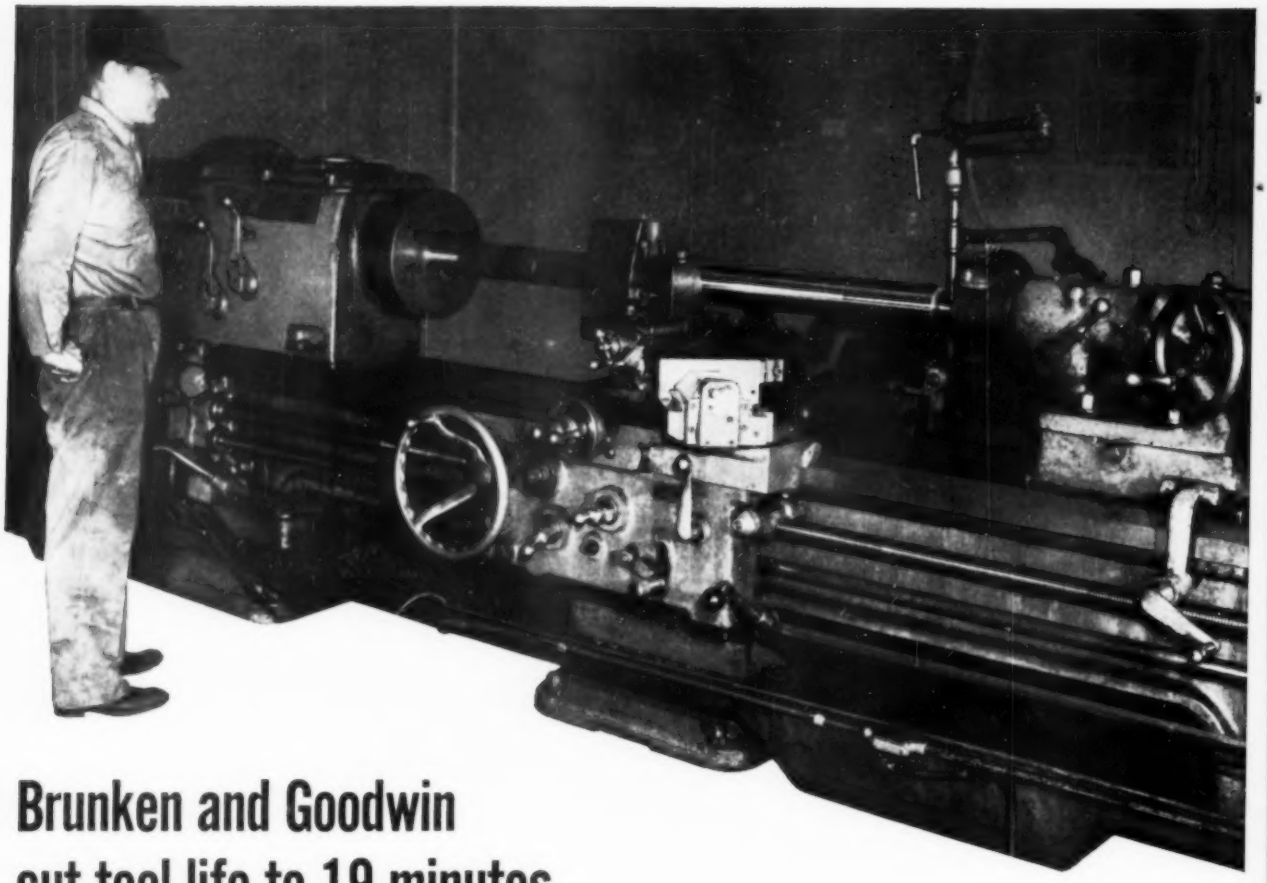
(continued on p 196)

Lester M Cole, general sales manager of Warner & Swasey Co, Cleveland, has been elected vice president, sales. (*AM* — April 20, p229)

John L Molner has been elected a vice president of National Acme Co, Cleveland. Formerly chief engineer, he succeeds **A E Drissner** who has retired

Arnold N Hellewell has been appointed sales director for turret drilling machines, Brown & Sharpe Mfg Co, Providence. He has been associated with the company's Machine Tool Division, working in the Ohio area

DON'T WASTE $$$ IN YOUR



Brunken and Goodwin cut tool life to 19 minutes . . . and doubled this machine's output

Here is one example of improved profits made possible by sacrificing tool life to gain *top machine efficiency* and lower cost-per-piece.

At Brunken and Goodwin Tool and Engineering Company, Maywood, Illinois, a closely recorded test showed that the same operator, using identical equipment and tooling could produce over two times as much with a $2.63 reduction in cost-per-piece.

In the test set-up a 20hp Monarch Lathe was used to turn a piece of 8620 steel, 280 Brinell hardness, to 5" outside diameter. For the ¼" depth of cut, Kennametal Grade K7H turnover type (throw-away) inserts with 6 edges were used throughout.

As shown in the table at right, this company reduced tool life from 120 minutes to 19 minutes. Tool insert costs thus increased from $1.18 per day to $7.45. But this expense means relatively nothing because production soared from 13 to 30 pieces per day—reducing cost-per-piece from $5.01 to $2.38—*a 48% decrease.*

Your Kennametal Carbide Engineer will gladly show you results from other actual tests. Ask him for more information on how you can trade pennies in tool costs for dollars gained from top machine output . . . or write KENNAMETAL INC., Latrobe, Pennsylvania.

	Before	Now
Tool life per edge	120 min.	19 min.
Machine cost/8-hr. day	$64.00	$64.00
Tool cost/8-hr. day	$ 1.18	$ 7.45
Cost per 8-hr. day	$65.18	$71.45
Pieces per 8-hr. day	13	30
COST PER PIECE	$ 5.01	$ 2.38

Write for booklet "There's Profit in Retiring a Tradition."

MACHINE OUTPUT TO SAVE ¢¢¢ IN LONGER TOOL LIFE!

There are hundreds of machine shops in the Nation today that could DOUBLE THEIR PRODUCTION OVERNIGHT, reducing costs and helping to relieve the squeeze on profits, by merely substituting a NEW IDEA in place of an old, traditional method they are now using.

All they have to do is to start operating their machines to get maximum OUTPUT . . . instead of operating them to get maximum TOOL LIFE. They are saving pennies through longer tool life . . . but they are wasting dollars in unused capacity of expensive machines, the unused talents of skilled operators and possibly in overtime costs to meet schedules.

This method of reducing costs by increased machine output is NOT an experiment. It doesn't call for you to be a guinea pig to try it. It has been PROVEN-IN-USE by dozens of progressive plants, and the results have been astounding.

Some of the dollars-and-cents results are recorded here. They can be duplicated in any plant that has good machines . . . and that is ready to challenge old ideas about tool life.

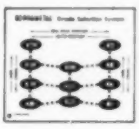
Just put yourself in the place of some of these successful users. Take a mental trial-balance, and estimate the savings you might make. Ask yourself this all-important question . . .

Which pays off best . . . long tool life . . . or top machine output?

Typical Examples—Same Machines . . . Same Tools . . . Same Workpieces								
	Job No. 1		Job No. 2		Job No. 3		Job No. 4	
	240-Minute Tool Life Setup	25-Minute Tool Life Setup	75-Minute Tool Life Setup	25-Minute Tool Life Setup	120-Minute Tool Life Setup	80-Minute Tool Life Setup	120-Minute Tool Life Setup	22-Minute Tool Life Setup
Machine Cost per Hour	$ 8.00	$ 8.00	$10.00	$10.00	$ 9.00	$ 9.00	$ 9.00	$ 9.00
Tool Cost per Hour	$ .04	$ .40	$ .36	$ .76	$ .14	$ .215	$ .14	$ .77
Cost per 8-Hour Shift	$64.32	$67.20	$82.88	$86.08	$73.12	$73.72	$73.12	$78.16
Pieces per Shift	51	181	8	17	94 hrs./pc.	41 hrs./pc.	8	16
Cost per Piece	**$ 1.26**	**$ .37**	**$10.36**	**$ 5.06**	**$859.16**	**$377.81**	**$ 9.14**	**$ 4.88**
Cost Reduction	70%		51%		56%		47%	

TO MULTIPLY YOUR MACHINE OUTPUT...YOU NEED THREE THINGS:

1. The "Three Man Tooling Team" that utilizes the specialized knowledge of your Tool Engineer, your Machine Operator, and the Kennametal Carbide Engineer *. . . to determine the right tooling for each job.*



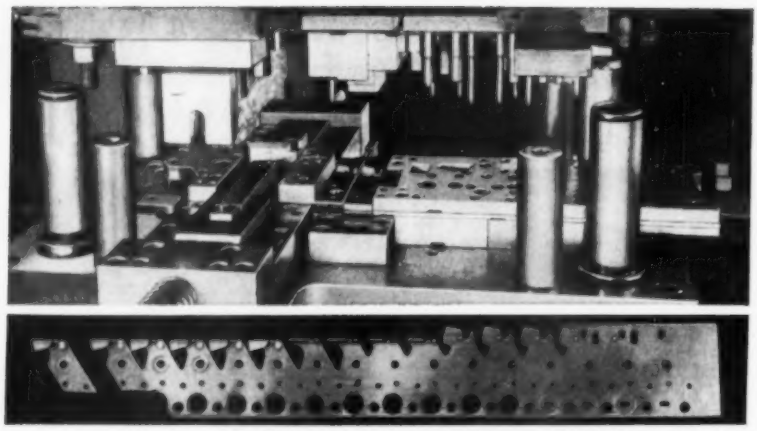
2. The complete range of Kennametal* grades that provides not only the exact properties needed, but assures the uniformity of quality that permits *accurate prediction of tool life.*

3. Kendex* (patented) Tooling that provides instant insert change without having to re-position the tool. This is the key to this new method . . . *frequent tool change without excessive down-time.*

5788

*Trademark

INDUSTRY AND
KENNAMETAL
. . . Partners in Progress



9 Station Progressive Die and ribbon showing can opener blade ready for assembly as it comes from die. Production: 70 pieces per minute.

HOW B. Jahn

PROGRESSIVE DIES MAKE

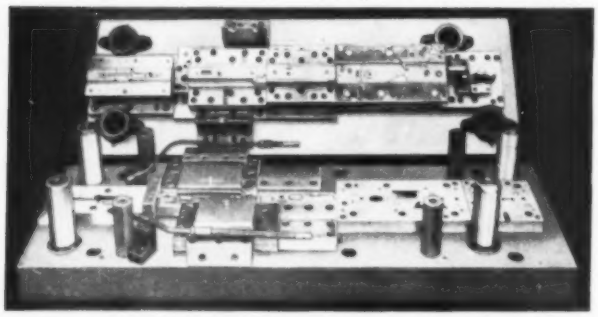
CAN OPENER COMPONENTS BY THE MILLIONS!

Components for can openers are mass produced—high production—close tolerances. Expense for down time can't be tolerated. Production methods must be flawless to protect profits.

That's why this successful can opener manufacturer left the **die design and production** responsibilities to B. Jahn.

You too can eliminate production operations, conserve raw material, save valuable hours, improve profits with B. Jahn Dies.

6 Station Progressive Die produces 2 completed can opener handles, right and left, at each press stroke. Production: 140 pieces per minute.



B. Jahn

Send for B. Jahn Brochure Today —

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

NAMES IN the NEWS...

ASTE Honors..

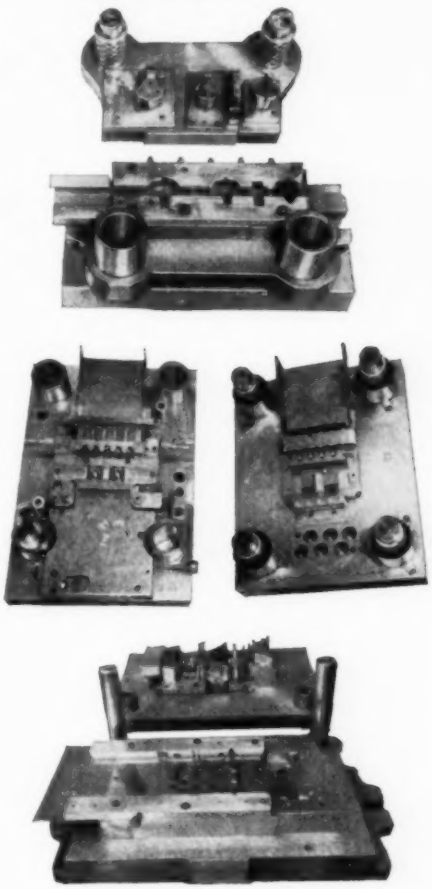
Swan E Bergstrom

Jacob J Jaeger

Alfred O Schmidt

Swan E Bergstrom, president of the Cincinnati Milling Machine Co, was chosen to deliver the Third Annual Eli Whitney Memorial Lecture at the 27th annual meeting of the American Society of Tool Engineers held in Milwaukee. Mr Bergstrom was one of seven prominent American leaders in the field of tool and manufacturing engineering who were presented with ASTE's 1959 National Honor

Produced by LATROBE for long-run dies...



Metalmasters

Fully-Uniform . . . Free-Machining DESEGATIZED®

OLYMPIC FM

High Alloy Die Steel

When your die production calls for long-run service . . . and you need a die steel that yields a superior machine finish without tearing—one that has excellent non-deforming characteristics in heat treatment . . . that's the time to use Latrobe's OLYMPIC FM.

OLYMPIC FM is an air hardening 12% chromium (D-2 type) die steel made to exacting standards by Latrobe Metalmasters . . . guaranteed to be fully-uniform in the distribution of wear-resisting carbide particles and alloy sulphides for better machinability . . . a result of Latrobe's exclusive DESEGATIZED® process of manufacture!

There's a wide range of Olympic FM sizes stocked at branch warehouses near you—Call today!

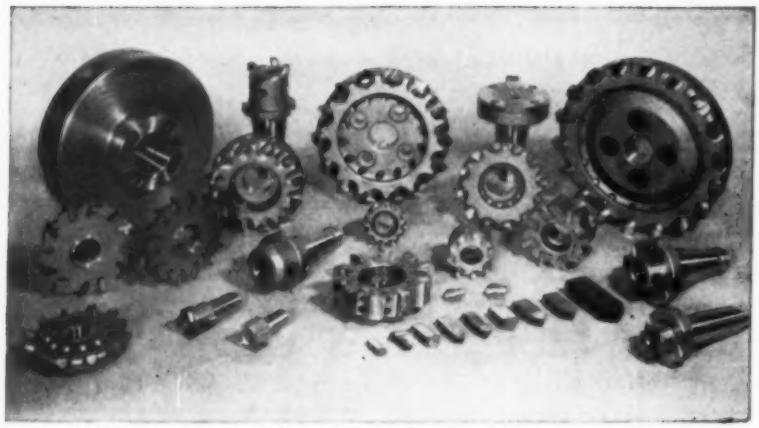
Or send for Olympic FM Data Sheet today!

LATROBE STEEL COMPANY

MAIN OFFICE and PLANT: **LATROBE, PENNSYLVANIA**

BRANCH OFFICES and WAREHOUSES:

BOSTON • BUFFALO • CHICAGO • CLEVELAND • DAYTON
DETROIT • HARTFORD • LOS ANGELES • MILWAUKEE
MIAMI • NEW YORK • PHILADELPHIA • PITTSBURGH
SAN LEANDRO • TOLEDO



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW "JOYDEX"

This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive, or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

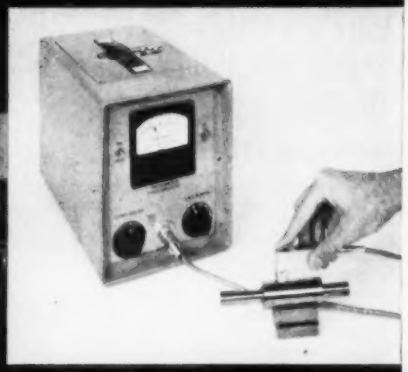
NAMES IN the NEWS...

Awards for outstanding achievements. **Jacob J Jaeger,** executive vice president of Pratt & Whitney Co, was awarded the ASTE Engineering Citation in recognition of his status as "an acknowledged leader in the field of industrial automation." **Alfred O Schmidt,** chief research engineer, Kearney & Trecker Corp, was awarded the ASTE Medal for his contributions as "an authority in the areas of machinability and thermodynamics of metals." George Romney, chairman and president of American Motors Corp, received the Society's Progress Award for his work as a "gifted organizer and respected leader in major industry." **Dr Mark Ellingson,** president of Rochester Institute of Technology, received the Society's Education Award for his exceptional efforts as a "constructive administrator in engineering." **T Bert Carpenter,** president of Bert Carpenter Co, was presented with the Joseph M Siegal Memorial Award, named after the Society's first president. A past president of ASTE, Mr Carpenter was cited as a "prime organizer and leading spirit in the Society's early development." **Kenneth J Trigger,** professor of mechanical engineering, University of Illinois, receiver the ASTE Research Medal for his work as a "basic researcher in the fields of physical metallurgy."

Charles I MacGuffie, manager of the special products department, Air Reduction Sales Co, has been elected president of the American Welding Society (additional elections below)

R D Thomas Jr, president of Arcos Corp, Philadelphia, has been elected first vice president of the American Welding Society. **A F Chouinard,** director of research and development, National Cylinder Gas Co, has been elected vice president of the Society.

Profilometer parts turned on RIVETT 1020S require no rework –save production time!



Profilometer manufactured by Micrometrical Manufacturing Co., Ann Arbor, Michigan.

Rivett 1020S Toolroom Precision Lathe in use in toolroom of Micrometrical Manufacturing Co., Ann Arbor, Michigan.

Micrometrical is famous as a manufacturer of precision instruments, such as the Profilometer, designed to measure surface roughness in millionths. Micrometrical highlights an important Rivett feature in its statement:

"Because of its construction and weight, the Rivett 1020S Lathe has very little vibration, making it ideal for close tolerance work.

In time of need, during peak work loads, the Rivett is often used on short-run production work, especially on intricate and complicated parts requiring extremely fine finishes as measured with the Profilometer."

RIVETT
"Steelway" Lathes

RIVETT LATHE & GRINDER, Inc.
Dept. AM-5, Brighton 35, Boston, Mass.

Inquire about the 1020S Toolroom Precision Lathe now. Write for 16 page catalog and the name of your nearest dealer.

☆

Here's a Unique Steel Type Holder . . . the NEW Slot-Lock Model

for ALL-PURPOSE MANUAL PRODUCT MARKING

MANY FEATURES:

- For general purpose marking which requires multiple characters and frequent changes in the setup
- The type seats on a special hardened anvil which insures uniform depth of impression and prevents type recession
- Type inserts cannot be put into holder incorrectly
- All type is locked in place securely by a properly-hardened, tempered spring
- Type changes can be made quickly and easily
- Uses type made by NM 'Cold-Upset' process.

NOTE—the Slot-Lock is also available for machine or press operation.

ABOUT NEW METHOD MANUAL DEVICES

Whatever your hand marking requirements, New Method has a COMPLETE LINE OF PRODUCTS and the experienced personnel to take care of them—products for any kind of marking on any shape of surface. You'll find all these, and more, illustrated fully in the new MS-59 Catalog.

The New Method 'COLD UPSETTING' PROCESS

This is a special metal treating process which assures much longer stamp life and better marking than can be attained from machine-cut characters. The 'Cold-Upset' process, developed by New Method engineers, and refined by years of research, has withstood the on-the-job test of time.

OTHER NEW METHOD MARKING DEVICES

• A complete line of automatic roll markers for most marking requirements, each designed for a specific need.

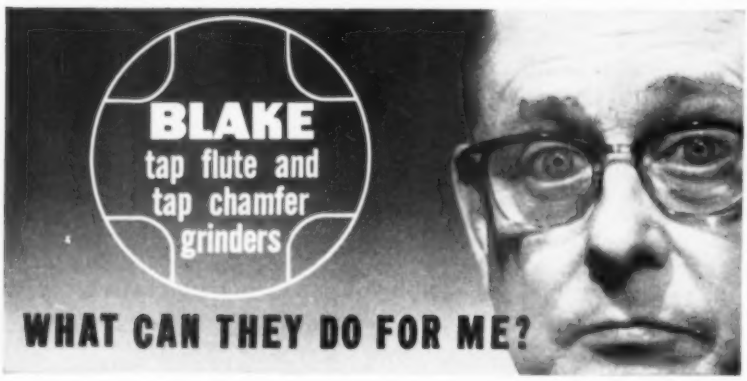
Write today for NEW CATALOG MS-59

SINCE 1931

NEW METHOD STEEL STAMPS, INC.

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

CIRCLE 312 READER SERVICE CARD



In a word, plenty.

They can make your taps last up to six times longer.

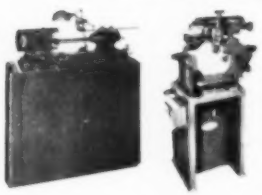
They reduce work spoilage because they enable taps to cut more accurately, more uniformly, with less strain.

They can cut your present tap costs up to 65%.

We didn't get these facts out of thin air. They come from actual case histories in metal-working plants where taps are sharpened regularly with Blake Flute and Chamfer Grinders.

These are high-precision machine tools. But they are not expensive. And they're simple enough to operate so that anyone in your plant can become accomplished at precision tap grinding with a minimum of fuss and feathers.

WANT PROOF? Just ask for it. You'll be glad you did.



Blake Chamfer Grinder Blake Flute Grinder

Blake — and only Blake Flute and Chamfer Grinders, used in combination, create or restore: 1. exact indexing of cutting edges. 2. controlled rake angles for each job. 3. correctly ground spiral points. 4. perfectly relieved chamfers . . . make one tap do work of six!

EDWARD **BLAKE** COMPANY, INC., 435 CHERRY STREET, WEST NEWTON 65, MASS.

NAMES IN the NEWS...

Roland L Guerin Jr has been appointed sales manager of Clearing's Aircraft & Missiles Division. He was formerly director of special projects, Hufford Co

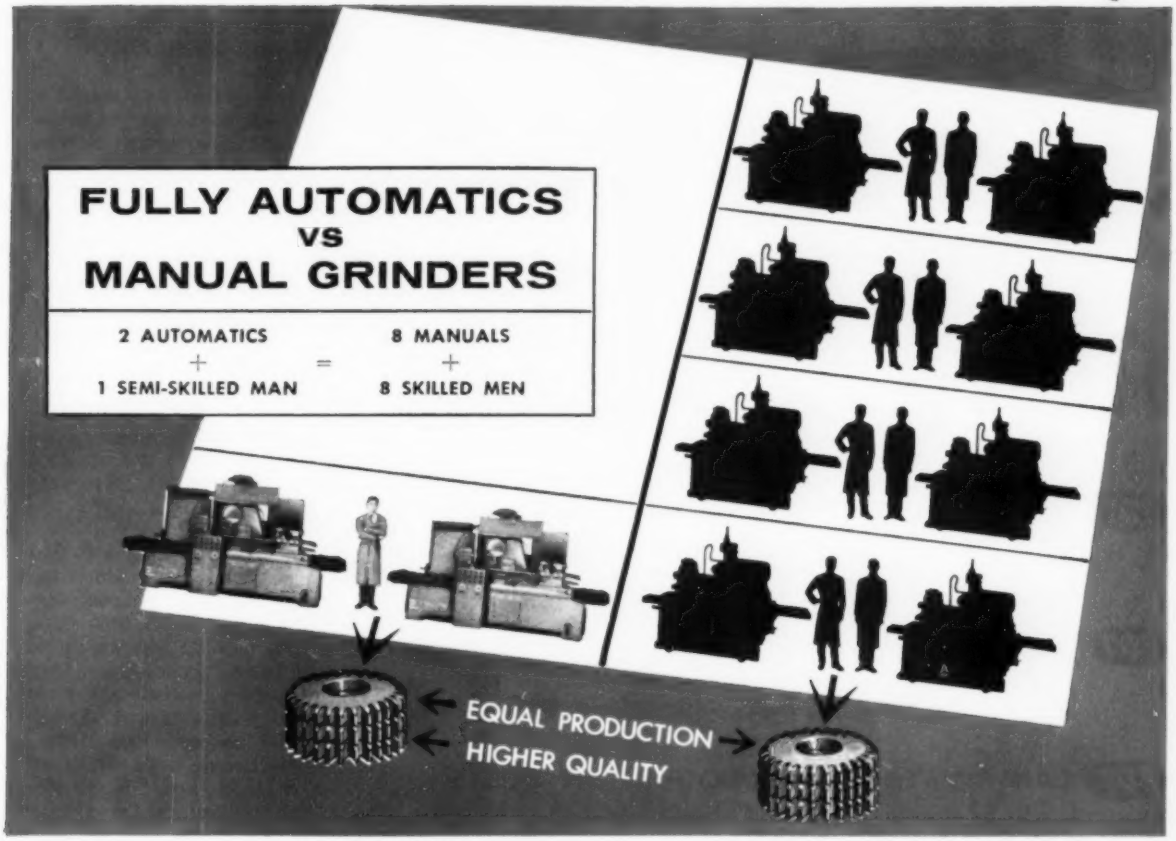
Eugene P Berg has been appointed general manager of Link-Belt Co's Chicago operations which consist of the Pershing Road and Caldwell plants. Mr Berg was previously manager of the former facility. **T Webster Matchett** has been appointed manager of the Caldwell plant to succeed **G Walter Ostrand** who has retired.

Richard C Bryan has been named manager of manufacturing and **A C Schliewen** works manager of the White Motor Co, Cleveland. Mr Bryan was previously division manager of truck assembly and planning, and Mr Schliewen division manager, truck.

Vance T Wray has been named manager of Chrysler Corp's new McGraw Glass Plant. He has been serving as plant manager at McGraw, formerly a stamping facility.

Allan Ray Putnam has been named managing director of the American Society for Metals. (*AM*—April 20, p229)

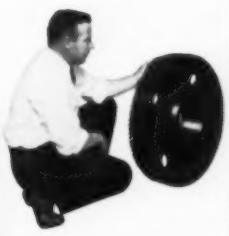
Precision gear grinding economy



—Plus this 4-way versatility

Choose from any of these cycles with selective feed increments:

1 Rough grinding
2 Rough grind; finish grind
3 Rough grind; semi-finish grind; finish grind
4 Manual grind



GEAR DATA

No. Teeth	96
Pitch Diameter	26.7"
Diametral Pitch	3.6
Pressure Angle	25°
Face Width	4.5"

FLOOR TO FLOOR PRODUCTION TIME

Single Gear/Arbor	55 min/gear
Two Gears/Arbor	33 min/gear

GEAR ACCURACY

Involute Profile	Within .0002"
Tooth to Tooth Spacing	.0003" max.
Runout of Pitch Diameter	.0006" total
Lead Error	Less than .0001"/"

GEARGRIND Detroit

UP TO 36" P.D.

For all the facts—write today!

THE GEAR GRINDING MACHINE COMPANY

3919 Christopher, Detroit 11, Michigan

Manufacturers of:

RZEPPA ("Sheppa") Constant Velocity Universal Joints 58-MT5A

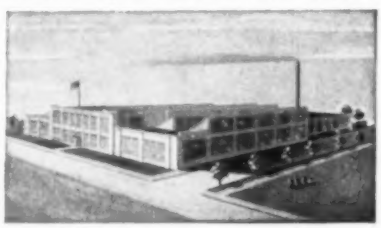
Here's how CDT can help you

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



FREE: *New brochure listing facilities, equipment, etc. Write today.*

Columbus Die-Tool
AND MACHINE COMPANY
P.O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NEW BOOKS...

MECHANICAL WORLD ELECTRICAL YEAR BOOK 1959 EDITION. *Published by Emmott & Co Ltd, 31 King St W, Manchester 3, England. 359 p, 4 x 6. Price 3/6 ($0.65).*

In this new edition, the material on electronics has been enlarged by the inclusion of a new section on transistors, and a section has been added on magnetic amplifiers. Another new section deals with ultrasonics, and there is also information on the insulation and overload capacity of electrical machines, and the care of control gear.

•

F B I REGISTER OF BRITISH MANUFACTURERS—1959. *Published by Kelly's Directories Ltd and Iliffe & Sons Ltd, Dorset House, Stamford St, London S E 1, England. 1140 p, 7½ x 9½. Price 42/- ($5.88).*

This comprehensive guide to British Industry lists the products and services of over 7500 member companies under more than 5400 alphabetical headings. In addition to the classified buyers' guide section, there are seven other sections giving addresses of companies and valuable information on trade associations, proprietary names, trade marks, etc. French, German, and Spanish glossaries give translations of every product term used in the main section of the guide, each being numbered for easy reference between English and the foreign translation.

•

KEMPE'S ENGINEERS YEAR-BOOK. *Published by Morgan Bros (Publishers) Ltd, 28 Essex St, Strand, London W C 2, England. 2740 p, 4¾ x 7. (2 Vol) Price 82/6 ($8.55) plus postage.*

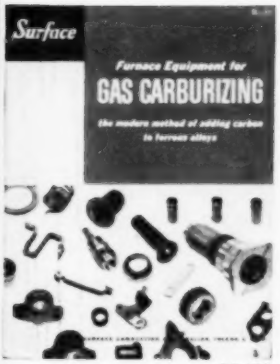
In this 64th edition, the editors have carried out a tremendous number of additions and alterations in 24 of the book's 79 chapters, as well as completely rewriting the chapters on flow metering and mechanical testing, refrigeration, and paints and varnishes. Virtually every one of the many phases of engineering is covered in this valuable reference work, and the index alone carries over 17,000 entries. As an example of the intensive effort employed to keep this work up to date it may be mentioned that the chapter on mechanics now includes the fundamental formulas dealing with the motion of missiles satellites, and escape velocity.

WHAT'S NEW

IN HEAT TREATING?

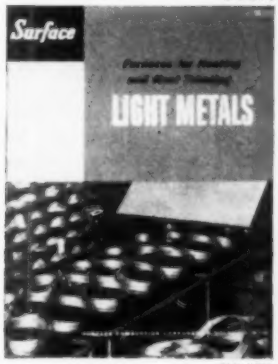
this library of technical information is yours for the asking

SC-181



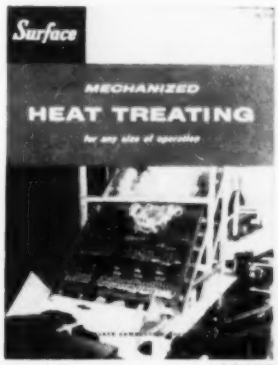
SC-172

SC-178



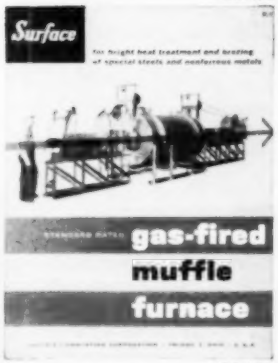
SC-171

SC-175

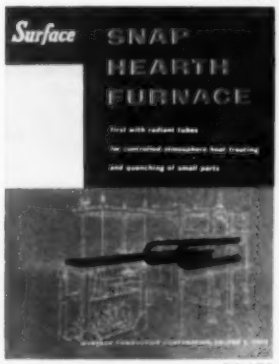


SC-176

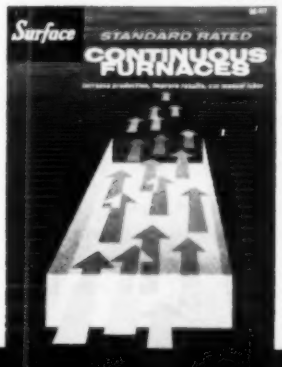
SC-174



SC-179



SC-173



SC-177

SURFACE COMBUSTION CORPORATION

2365 Dorr Street, Toledo 1, Ohio

☐ Have Sales Engineer call ☐ Send Bulletins checked

☐ SC-171 ☐ SC-173 ☐ SC-175 ☐ SC-177 ☐ SC-179

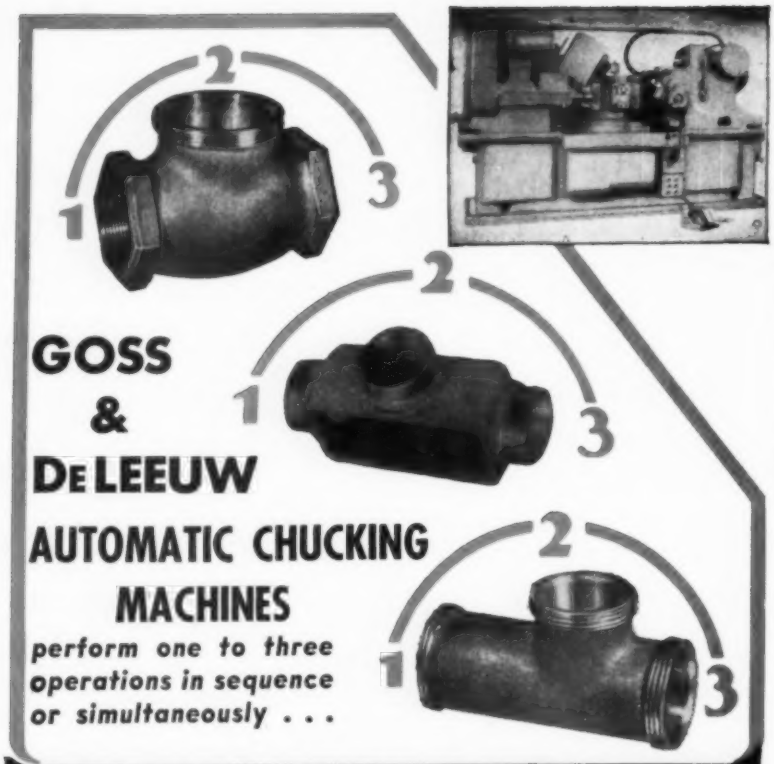
☐ SC-172 ☐ SC-174 ☐ SC-176 ☐ SC-178 ☐ SC-181

name & title .....

company .....

street .....

city ..... zone ..... state .....



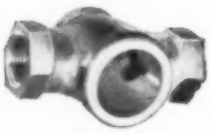
GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINES

perform one to three operations in sequence or simultaneously . . .

TO CUT PRODUCTION COSTS...

More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & DeLeeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.

Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.



Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS and DE LEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

GOSS & DeLEEUW — QUALITY PRODUCT-QUANTITY

NEW FILMS...

STEEL SHOT. *Produced by Wheelabrator Corp, Abrasives Div, 1140 S Byrkit St, Mishawaka, Ind. 16 mm, sound, color. Running time 25 min. No charge.*

Available with or without a speaker from Wheelabrator, this new film shows the manufacture of steel shot and grit from scrap selection to packaging. Clearly illustrated are the close controls and unique processes needed to produce billions of tiny, heat-treated pellets to close hardness and microstructure specifications. Processes are traced through the electric arc furnaces, casting, heat treating, sizing, and packaging. The film is recommended as program material for chapter meetings of technical societies.

•

ENGINEERED SCREW MACHINE TOOLING APPLICATIONS. *Produced by Brown & Sharpe Mfg Co, Machine Tool Div, Providence 1, RI. 16 mm, sound, color. Running time 35 min. No charge.*

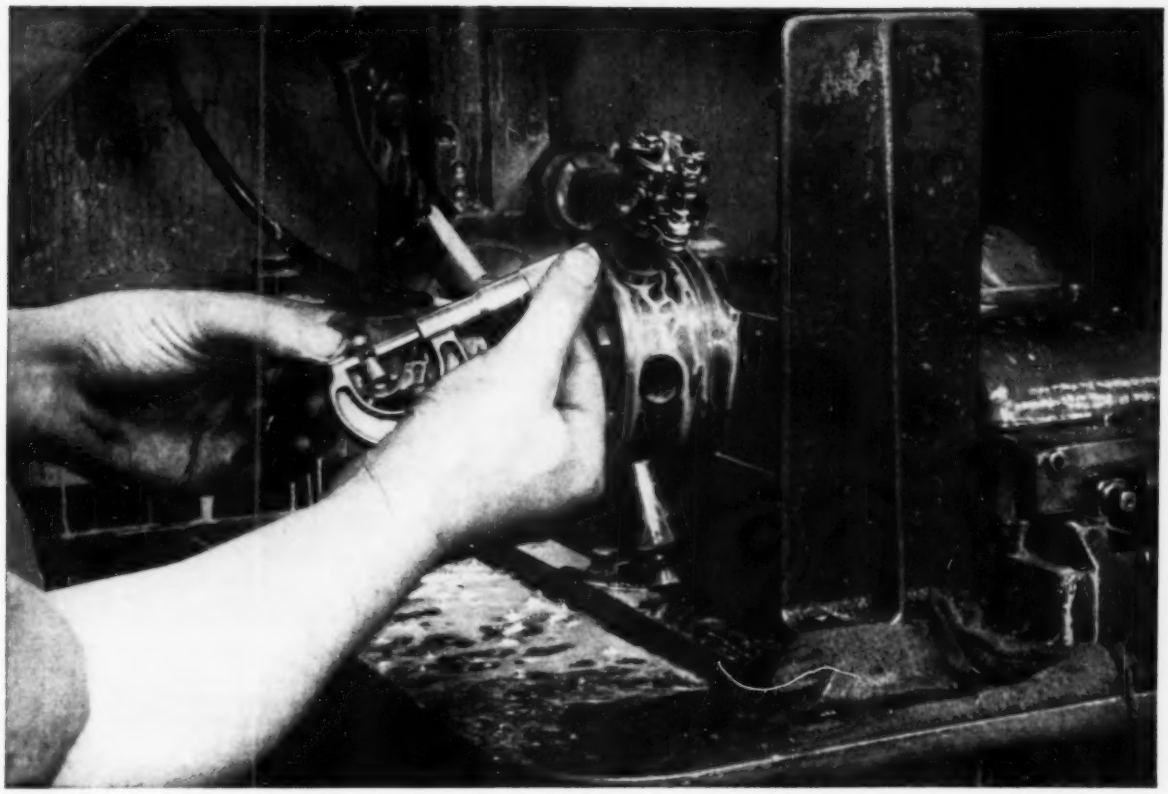
This new film features eight practical applications of the latest-design automatic screw machines. Using close-ups and slow motion, some of the sequences detail the relative position of the tools during close timing operations. Also featured are standard and special attachments, with explanations of the tool engineering involved in their application.

•

PHOTO-REPRODUCTION. *Produced by Eastman Kodak Co, Graphic Reproduction Div, Rochester 4, NY. 16 mm, sound, color. Running time 23 min. No charge.*

Designed primarily for engineering management, this new presentation shows how large and small companies can boost efficiency and cut drafting costs by applying photoreproduction processes. New short cuts, new savings, and new standards of legibility are explained in detail, with an explanation of how a week's drafting job can be cut to 8 hr by reclaiming illegible originals and using cut-and-insert work on photographic engineering intermediates.

Focusing on typical cost problems, the movie describes the use of intermediates as "second originals," from which prints are run off; use of photo-drafting techniques to reduce revision time; and the photo-drawing technique which produces a combined photograph and assembly diagram.



Machinecraft gets .0005" tolerances with Cities Service Chillo Cutting oils!

Machinecraft, Inc., of Whitman, Massachusetts, makes a product that is surely the answer to many a textile man's fondest wish.

In place of old-style solid arbor top rolls, which often drip lubricant onto the fabric, Machinecraft has developed "the anti-friction top roll."

Operating on ball bearings, this unique invention requires almost no lubrication, therefore eliminates staining problems. In addition, it permits higher speeds of operation and produces more uniformly woven fabric.

In all of this, extremely intricate machining is required —and Cities Service Chillo Cutting Oil plays a crucial role.

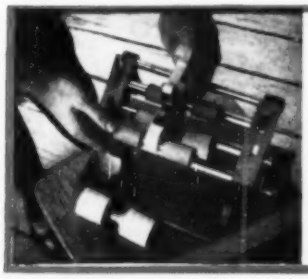
Using Cities Service Chillo "A," Machinecraft is actually achieving tolerances as fine as .0005"! Moreover, Machinecraft reports that Chillo "A" gives "excellent tool life, produces a fine finish, has unusual stability, and offers continuous quality from batch to batch."

"In addition," continues this well known firm, "Cities Service provides us with exceptional technical assistance and good delivery service."

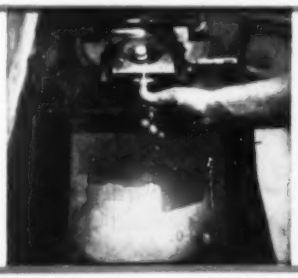
There's little to add to what Machinecraft says except a reminder that *you* can expect similar results with Cities Service, too. Talk with a lubrication engineer from the nearest office. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

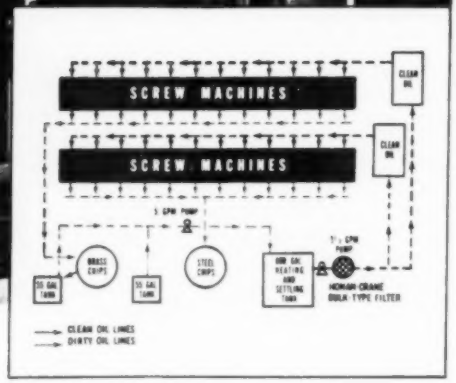


Machinecraft's Anti-Friction Top Roll is rapidly replacing old-style solid arbor type top rolls in textile mills. It prevents staining, permits greater operating speeds.



Shadowgraph is method of checking accuracy of precision machined parts for anti-friction top roll. Machine magnifies and projects the part's shadow outline. Tolerances are as fine as .0005".

CFC HONAN-CRANE FILTER Keeps Cutting Oils Clean— Reduces Downtime and Rejects



At Leviton Manufacturing Company, one of the largest manufacturers of electrical wiring devices, this CFC Honan-Crane Filter maintains the clarity of cutting oil used in the operation of 25 screw machines.

Since 1953, this CFC Honan-Crane Filter has purified over 200,000 gallons of cutting oil at Leviton Manufacturing Company, Brooklyn, N. Y. Tool life has been increased as much as 35-40%. Maintenance has been substantially reduced. There has been less downtime, fewer costly rejects.

The CFC Honan-Crane Filter uses Palconia (inert cellulose) to remove chips and other abrasive particles. Palconia refills are changed only 3 times a year after handling over 50,000 gallons of contaminated oil. Machines are cleaned only once a week — in a few minutes' time — by use of the Honan-Crane Sump Cleaner which removes contaminated oil and chips. They are re-filled with clean oil purified by the CFC Honan-Crane Filter.

CFC Honan-Crane Filters can be engineered to your exact requirements — for all types of industrial oils. For technical literature, write to Department **AM.**

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo FILTERS — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC FILTERS — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*

MACHINE TOOLS can be TAUGHT

. . . to produce closer tolerances, Faster and Automatically . . .

. . . by use of *MICROtrol** gaging and control elements, selected combinations of these *MICROtrol* 160 elements permit you to control production automatically. They will inspect each piece, sort out the rejects, and tell the operator and/or machine tool *when* and *how much* correction is needed. Simple and flexible, 54 *MICROtrol* elements can automate all of your production immediately . . . or by stages.

MICROtrol electronic inspection and controls make needed corrections before rejects pile up . . . without stopping the machine tool to check work. *MICROtrol* takes pressure off the operator . . . allows him to produce more . . . with greater accuracy.

Centerless grinding tolerances up to .000025 are possible by adding an INCHWORM® motor to the *MICROtrol* 160 system. When used in a closed loop system, *MICROtrol* elements automatically gage work, feed back correcting information to the INCHWORM, compensate for wheel wear . . . instantaneously.

SEE IT WORK IN YOUR PLANT . . .

at Our Expense!

The INCHWORM can be installed on your centerless grinder in less than an hour—and proves itself immediately. We will install it in your plant, *on approval*, upon the recommendation of our sales engineer.

Contact your nearest Cutler-Hammer office or write AIL for full details, and descriptive literature.

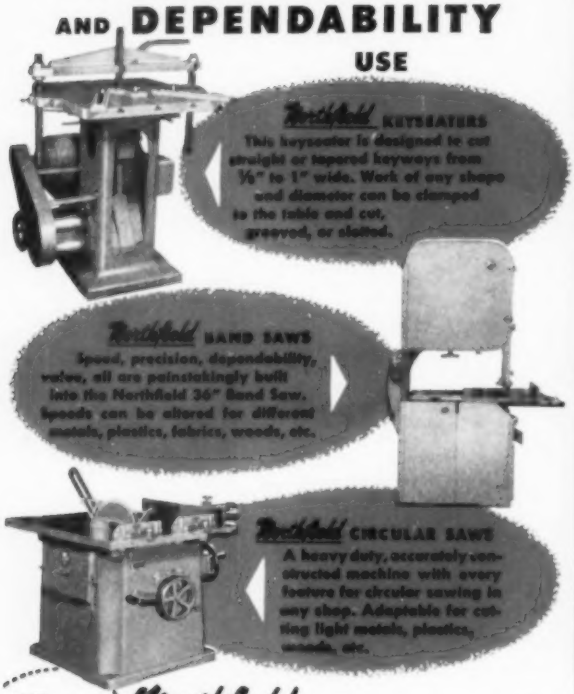
*(TRADE MARK)

AIRBORNE INSTRUMENTS LABORATORY

1345 NEW YORK AVENUE, HUNTINGTON STATION, L. I., NEW YORK

A DIVISION OF CUTLER-HAMMER, INC.

FOR **EFFICIENCY**
AND **DEPENDABILITY**
USE



Northfield KEYSEATERS
This keyseater is designed to cut straight or tapered keyways from ⅛" to 1" wide. Work of any shape and diameter can be clamped to the table and cut, grooved, or slotted.

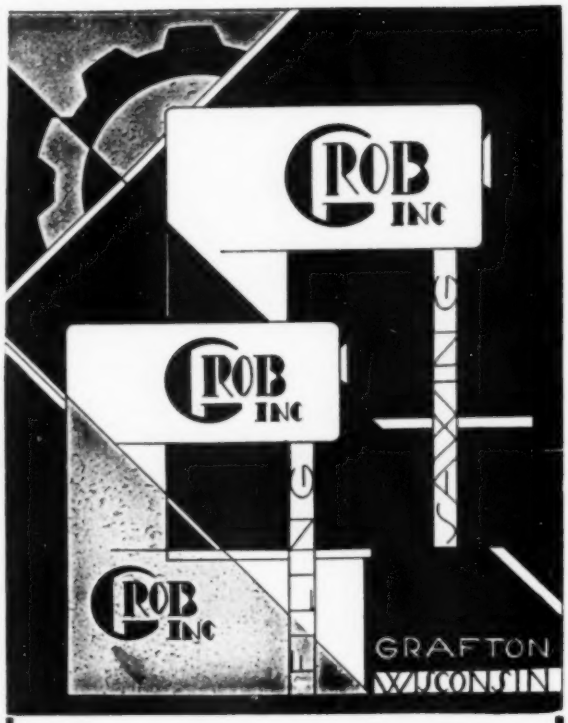
Northfield BAND SAWS
Speed, precision, dependability, value, all are painstakingly built into the Northfield 36" Band Saw. Speeds can be altered for different metals, plastics, fabrics, woods, etc.

Northfield CIRCULAR SAWS
A heavy duty, accurately constructed machine with every feature for circular sawing in any shop. Adaptable for cutting light metals, plastics, woods, etc.

WRITE TODAY FOR LITERATURE AND PRICES!

Northfield FOUNDRY & MACHINE CO.
NORTHFIELD, MINNESOTA, U. S. A.

CIRCLE 321 READER SERVICE CARD



Machines for Filing, Sawing, Gear & Spline Rolling.

CIRCLE 323 READER SERVICE CARD

THINK of it!

NOW you can have a boring head that will **BORE, FACE, TURN** and **GROOVE** at no higher cost than you would pay for an ordinary, single purpose boring head

THINK
This over before buying that NEW head!!

A Boring Head That Won't Face is NOT Complete

Model "D"

Models for Any Size Machine
Write today for full details
CHANDLER TOOL COMPANY
MUNCIE, INDIANA

Chandler-Duplex
COMBINED BORING AND FACING TOOLHEADS

The new Grind-A-Matic is an air turbine grinding head which can be mounted either vertically or horizontally on almost any machine tool.

Its versatile application and high precision performance allow Grind-A-Matic to perform grinding operations normally done on an expensive jig grinder. Mounted the same as any standard tool, it becomes a close tolerance grinder for such work as internal grinding of tools, dies and fixtures.

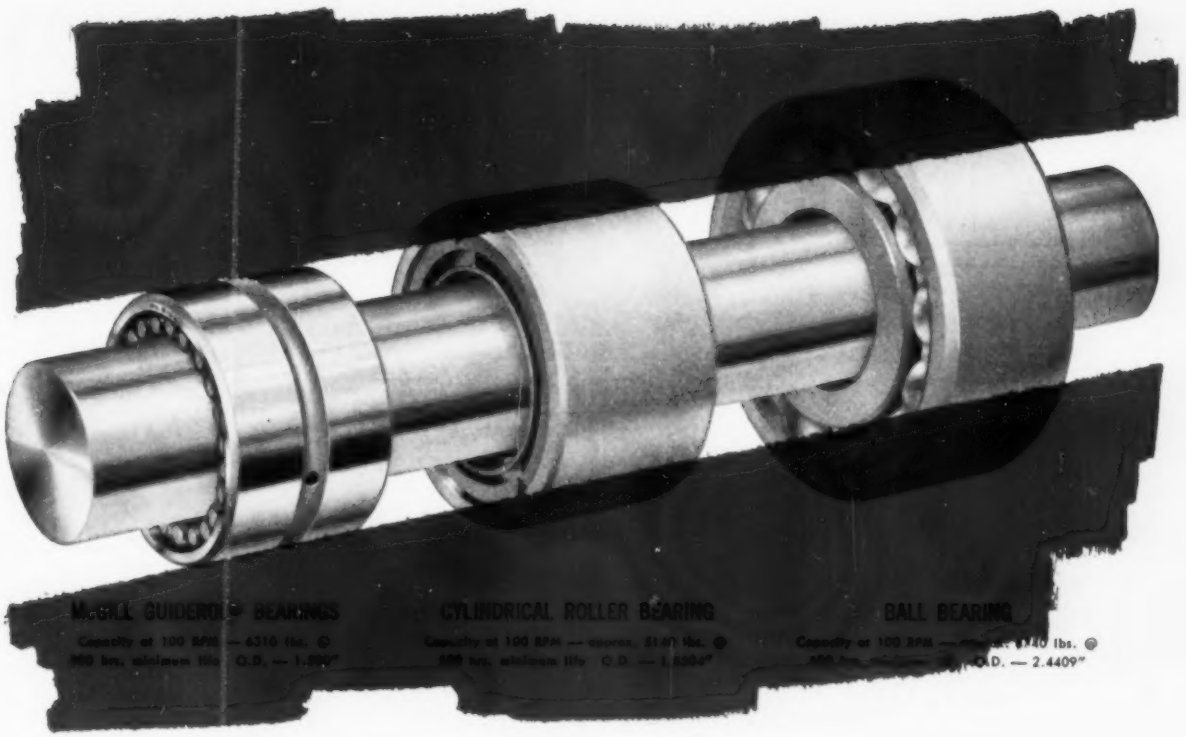
Threadwell **GRIND-A-MATIC**
provides jig grinder performance at drill press prices

- *Fine radial adjustment from "0" to .070" **while the spindle is rotating.***
- *Uninterrupted precision grinding*
- *Coarse adjustment from "0" through 1¼"*
- *Spindle speeds from 50 to 75,000 RPM*
- *Standard range from ⅛" to 2½" holes*
- *Adapted to include holes up to 5½"*
- *Sealed air turbine and spindle bearings*

Threadwell **THREADWELL TAP & DIE CO.**
Greenfield, Mass.

CIRCLE 322 READER SERVICE CARD

CIRCLE 324 READER SERVICE CARD



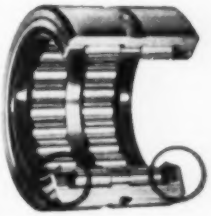
GUIDEROL® BEARINGS SAVE RADIAL SPACE
.....and still offer greater load capacity

This graphic illustration demonstrates the radial space saving advantages of McGill GUIDEROL bearings that offer still greater capacity than the other two types of bearing compared. For a common 1" shaft, the GUIDEROL bearing GR-16 has an O.D. of only 1½" with a capacity of 6310 lbs. Compared to a cylindrical type roller bearing the GUIDEROL bearing requires ⅜" less housing space and offers 23% more capacity. A ball bearing for the same shaft uses almost an inch larger O.D. to carry 1500 lbs. less radial load.

CENTER GUIDED ROLLERS

GUIDEROL bearings pack more performance into smaller radial space. Their construction offers the inherent high capacity of a full complement needle bearing combined with effective roller control. Center guided rollers limit roller skewing tendencies and prevent binding under adverse conditions in either horizontal or vertical mountings. This qualifies GUIDEROL bearings for applications which are too heavily loaded for retainer type needle bearings, but are subject to misalignment that precludes the use of unguided needle bearings. Standard GR series GUIDEROL bearings are available, with or without inners, in shaft sizes from ⅝" to 9¼" with capacities ranging from 2880 lbs. to 128,670 lbs. (at 100 RPM).

LUBRICATION LOCKED IN, CONTAMINATION OUT; IN SEALED GUIDEROL BEARINGS



Pre-lubricated and sealed SG series GUIDEROL bearings are interchangeable dimensionally with standard GR series GUIDEROL bearings. They offer 5 possible seal combinations. Specify the sealed bearings for applications that are exposed to dust, dirt, grit or where accessibility for lubrication is a problem. Your McGill representative will be happy to assist you with special application problems. Ask him for recommendations or write the McGill Engineering Department.

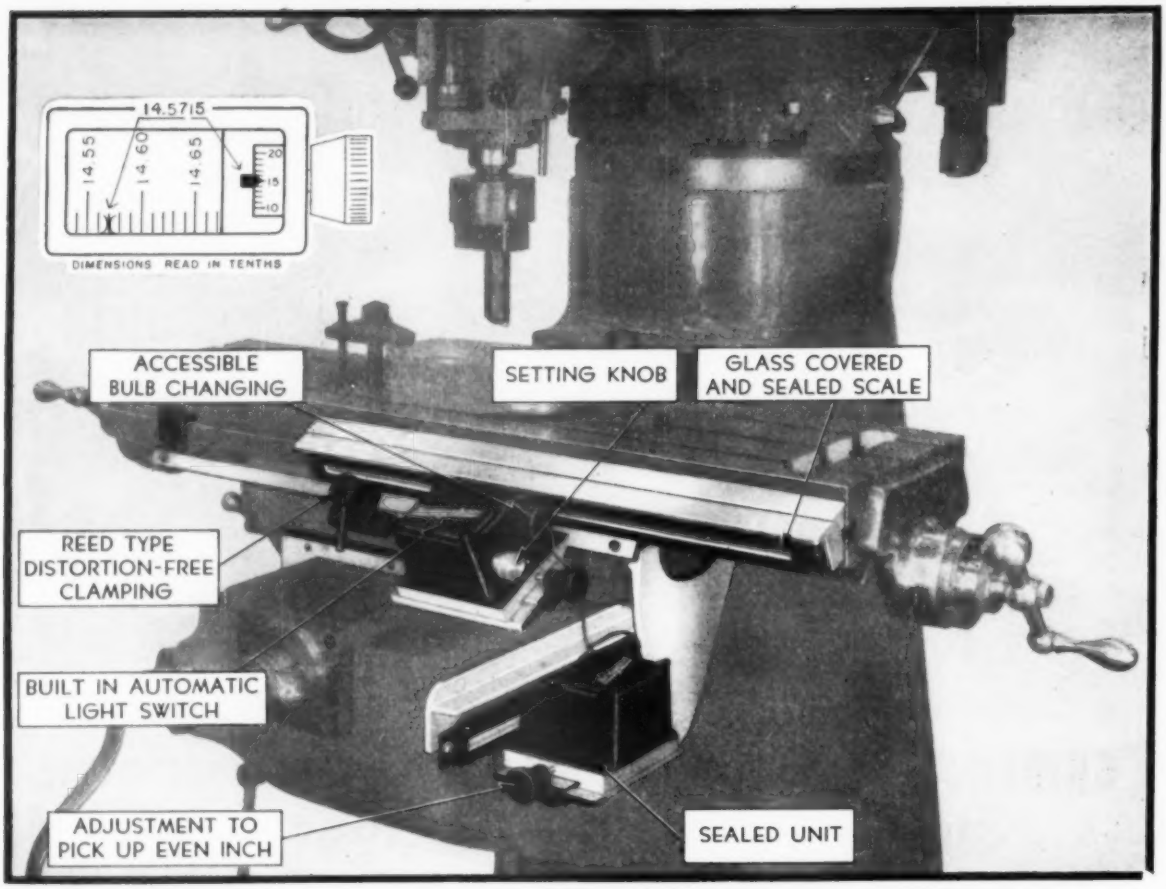
For Complete Data on Dimensions, Capacities and Application of McGill Precision Needle Bearings, Send for Free Catalog No. 52A.

engineered electrical products

McGILL®

precision needle roller bearings

McGILL MANUFACTURING COMPANY, INC., BEARING DIV., 300 N. LAFAYETTE ST., VALPARAISO, INDIANA



The New Bridgeport OPTICAL SYSTEM

...fast, accurate and efficient

By using the New BRIDGEPORT Optical System it is now possible to read a figure on the scale as it appears on the working drawing. It is not necessary to add any figures or make any vernier estimations. The operator's skill in reading a single line is all that is required.

The new BRIDGEPORT Optical System is an accurate and time-saving method for quick positioning of table in both planes.

The Optical System is installed at factory on new machines and is easily installed in the field on any Bridgeport Miller already in service.

Further facts are available through your nearest dealer or through us direct.

Bridgeport MACHINES, INC.
Bridgeport, Connecticut
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS

Are you "overmachining" parts like these?

If you machine gear cases, inspection doors, and other simple pieces not requiring dimensional accuracy, you can grind and save time on a Mattison "No. 153."

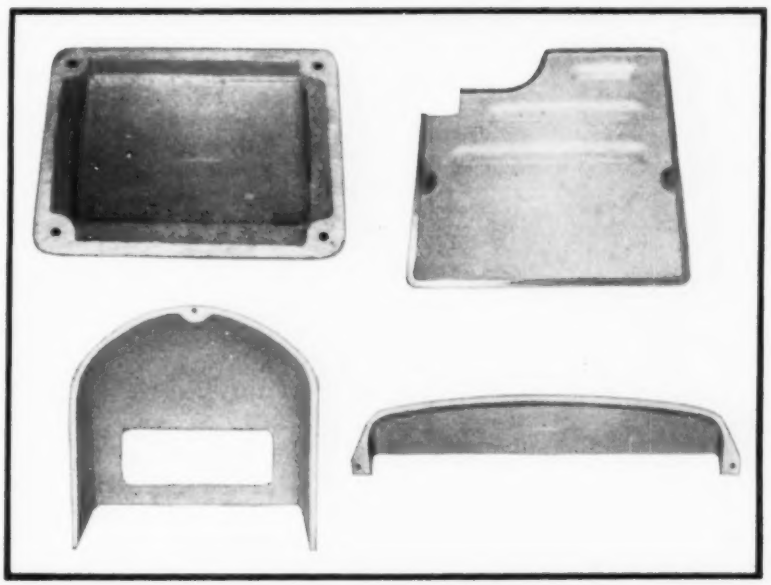
Any shop that uses cutter-type machining for low-tolerance parts can increase efficiency and reduce machining time with a general-purpose Mattison No. 153 vertical-spindle disc grinder.

In your foundry, on the assembly floor, or right in the production line, this versatile machine tool does a variety of jobs at surprisingly low cost . . . freeing your expensive equipment for other work.

Each piece is its own fixture . . .

The "153" eliminates time-consuming setups along with costly fixtures. On a tub grinder, the weight of the piece is all the clamping or fixturing you need.

What's more, you can quickly pregrind parts to be held on magnetic chucks for milling or finish grinding. Dimples, burned edges, and rough spots are removed easily and quickly—the smooth, flat surface increases holding power of the chuck, eliminates warpage, and promotes uniform accuracy.



Versatile tool for machinery builders . . .

The Mattison No. 153 gives machinery builders a versatile, cost-cutting tool, eliminates "overmachining" on aluminum and cast iron covers and plates. Sturdiness, smooth operation, and longer service life make it ideally suited for this type of work. Its 25-hp spindle motor, sturdy cast iron wheel dressing head, and heavy-duty thrust bearings (rated at 25,000 lb) are designed especially to satisfy the most rigid grinding requirements. And, a 53" dia. wheel with eight 1" or 2" segments make wheel handling easy and replacement possible at minimum cost.

Free method study

You can inspect, first hand, the value of Mattison's new Quick-Tilt surface grinder for machining your workpieces. Production tests show that the average grinding operation can be at least 50% more efficient with this new method. We will machine your parts in our Methods Laboratory and give you a complete job analysis which takes the guess out of grinding. There's no obligation—your Mattison dealer will make all arrangements.

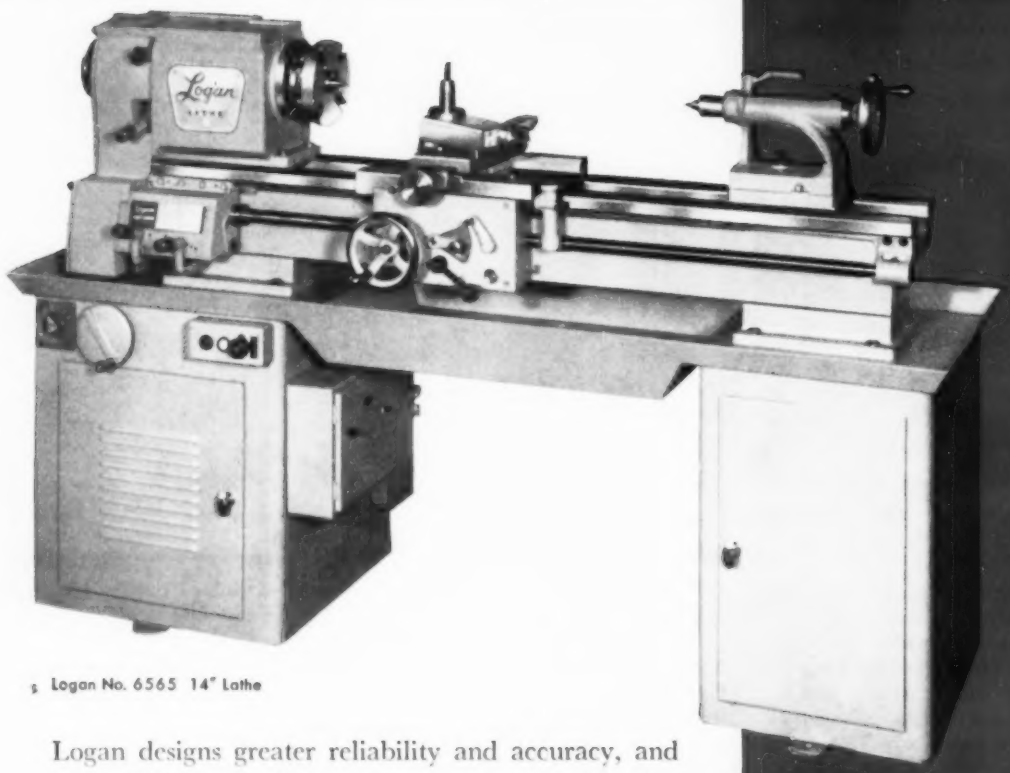
MATTISON MACHINE WORKS
Rockford, Illinois • Phone WO 2-5521

MATTISON MACHINE WORKS
HIGH-POWERED PRECISION SURFACE GRINDERS

CIRCLE 327 READER SERVICE CARD

its specifications add up
to high production capacity

Logan
14" Lathe



Logan No. 6565 14" Lathe

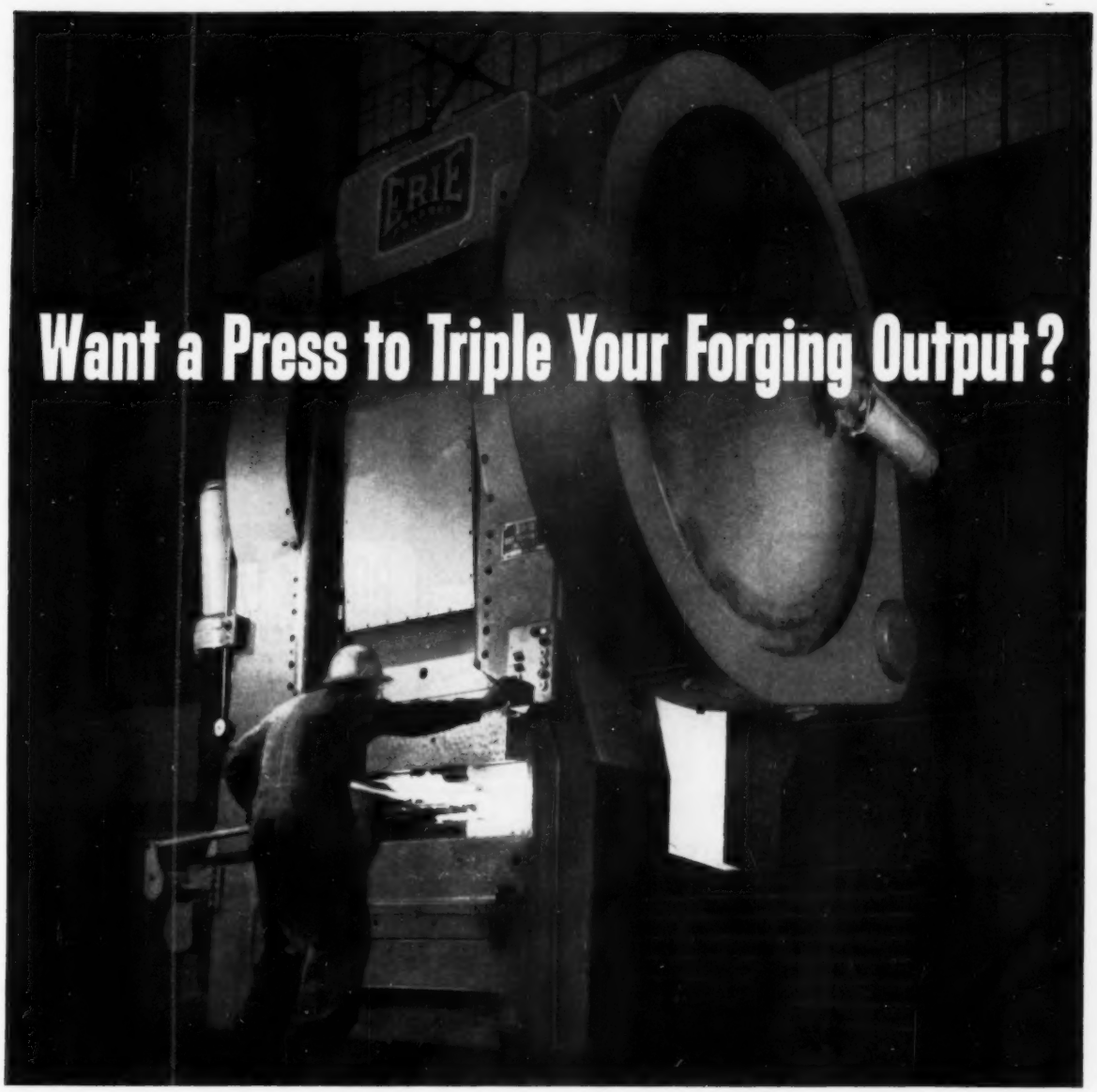
Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-quality features. For instance—

- An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload
- A variable-speed drive lets you change speed while work is turning—without shifting belts
- A warp-free lathe bed with high, strong walls braced by oversize ribs to withstand heaviest stresses; two V-ways and two flat ways are flame-hardened and precision-ground.

There are many more reasons why this and other Logan Lathes have a greater capacity. The specifications tell the story. Write for literature and complete information.

- Spindle speeds to 2000 rpm.
- 1½" Levermatic collet chuck capacity
- 14⅜" swing over bed
- 9" swing over saddle cross slide
- 40" between centers

LOGAN ENGINEERING CO. Dept. G-559 4901 Lawrence Ave., Chicago 30, Ill.



Want a Press to Triple Your Forging Output?

We'll build the press for all your forging requirements . . .

Tell us your forging problems and give us your production specifications—we'll do the rest.

Erie Foundry, one of the first companies to automate forging, can provide specially designed *high volume* presses in capacities of 1000 to 8000 tons. Instead of the three machines and nine men formerly required, now you need only one Erie automated forging press and only one operator observer—to triple your present production rate! Trimming, too, can be accomplished in a single production cycle. With billet supply and finished part removal conveyorized, it is possible to achieve a production volume of, say, 1200 track-link forgings per hour.

Erie Foundry has a complete line of machines designed for high volume production of such parts as connecting rods, gear blanks, automotive and tractor valves, pinions, track links and wheel hubs.

We would like to discuss application of automated presses to your production requirements. For the complete story, phone or write Mr. R. E. Sanford, Erie Foundry Company, Erie 5, Pa.

ERIE

ERIE FOUNDRY CO.

The world's great name in forging since 1895 EF-59-01

CIRCLE 329 READER SERVICE CARD

Take me to your buyer ...I'm the leader!

• Want to bring your brush costs down to Earth? Pittsburgh's complete line of power-driven and hand brushes... for any job, in any industry... can lead the way.

• For the address of your Pittsburgh Brush supplier, write or CALL COLLECT, Pittsburgh Plate Glass Co., Brush Div., 3221 Frederick Ave., Baltimore 29, Md.

PITTSBURGH PLATE GLASS COMPANY

2747

CAN YOU *SWING* IT.?

A heavy duty 40" swing lathe, built to handle that occasional large swing ROLL up to 60"!

Write for "It's a Dual Spindle"

BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO
MACHINE TOOL CENTER of the WORLD

CIRCLE 331 READER SERVICE CARD

SAVE 50%
or more in
CONTOUR GRINDING COSTS with Micromaster

VISUAL GRIND

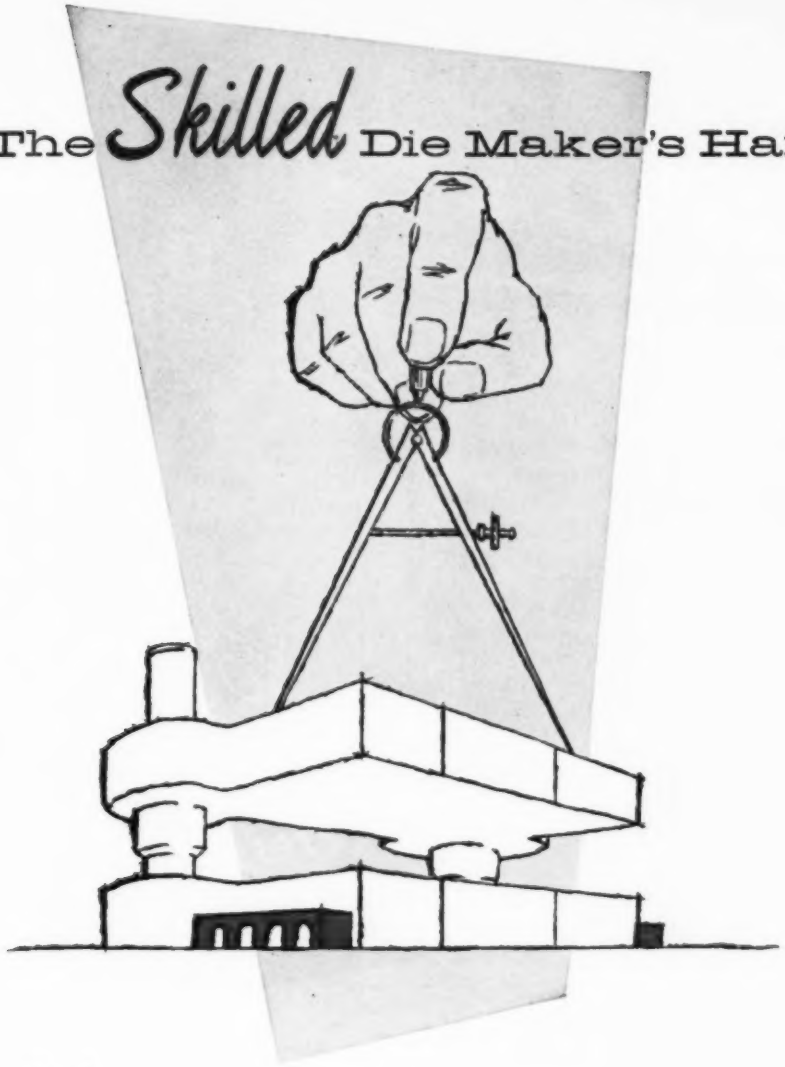
Sold by
Brown & Sharpe Mfg. Co.
Providence, Rhode Island

Visual Grind is manufactured by
The CLEVELAND GRINDING MACHINE Co.
1720 EDDY ROAD • CLEVELAND 12, OHIO

CIRCLE 330 READER SERVICE CARD

CIRCLE 332 READER SERVICE CARD

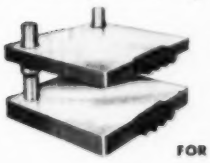
For The *Skilled* Die Maker's Hands...



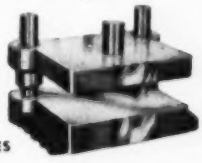
Precision DIE SETS FOR OVER 35 YEARS

Superior has pioneered many firsts in the die set industry and today still sets the standard for new innovations that eliminate guess work, help speed production of dies and eliminate unnecessary handling.

With over 35 years of experience in the die set industry Superior engineers are constantly working to develop new and better die sets to serve all industries from Rockets to Refrigerators.



SUPERIOR
STEEL PRODUCTS CORP.
2754 SO. 19th ST., MILWAUKEE, WIS.



FOR FAST LOCAL SERVICE CALL THESE EXPERT SUPERIOR REPRESENTATIVES

CEDAR RAPIDS, IOWA
Empire 2-7831
CHICAGO, ILLINOIS
OFf. Randolph 6-8871
Res. Keystone 9-9800
DAYTON, OHIO
Baldwin 2-6209
DENVER 1, COLORADO
Enterprise 234
PITTSBURGH, PA.
Tuxedo 4-4040

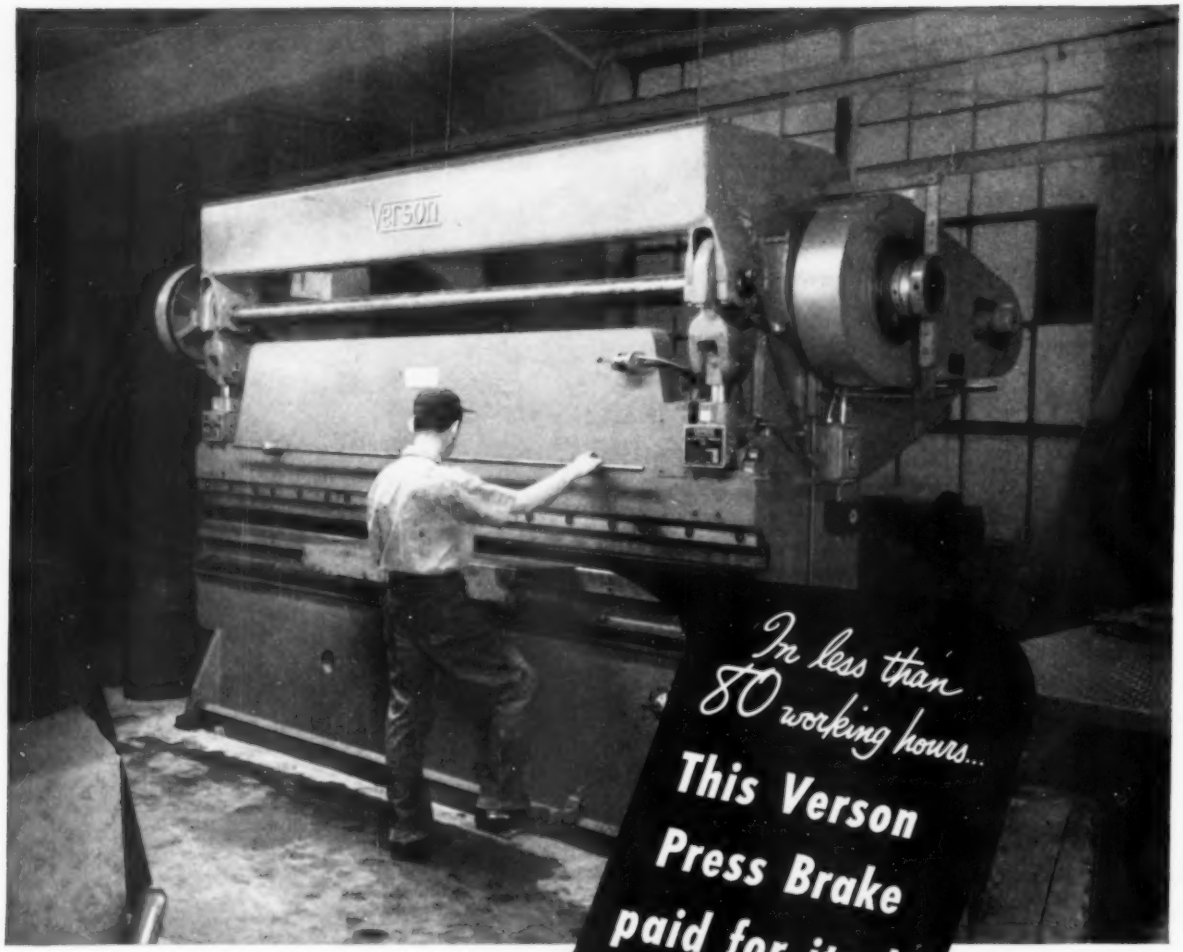
INDIANAPOLIS, INDIANA
Clifford 5-5666
LANSING, MICHIGAN
Iv 9-0214
MEMPHIS, TENNESSEE
Fairfax 3-7727
ROCKFORD, ILLINOIS
OH. 9-9331
Res. 7-9403
FAIRFIELD, CONN.
Edison 4-4282

ST. LOUIS, MISSOURI
Jefferson 3-1223
BRADENTON, FLORIDA
5-9661
MINNEAPOLIS, MINN.
Fr. 1-1321
RACINE, WISCONSIN
Melrose 2-1900
WARWICK, R. I.
Turner 4-2907

MELROSE PARK, ILLINOIS
Fillmore 5-5910
SYRACUSE, NEW YORK
Granite 4-0458
CHESHIRE, CONN.
Browning 2-4887
WEST NEWTON, MASS.
Bigelow 4-2070 & 2-6771
UNION, N. J.
Murdock 8-2270

BALTIMORE, MARYLAND
Belmont 5-2780 & 5-9492

2 plants to serve you
MILWAUKEE, WISCONSIN
Mitchell 5-6027
PLAINVILLE, CONN.
Sherwood 7-2761



Add Chicago Dryer Company, Chicago, Illinois, to the ever-growing list of satisfied Verson Press Brake owners. In the manufacture of "America's most complete line of commercial flatwork ironers", Chicago Dryer Company uses this Verson No. 2010 Intermediate Series Press Brake to form flatwork ironer end frames from 5′ lengths of 11 ga. mild steel. Two bends are made, utilizing the Verson Press Brake handled by two operators. In the past, this job required six men working with a hand brake.

Two trays are furnished with each of fifteen flatwork ironer models manufactured. Formed from 12′ lengths of 16 ga. mild steel, the trays were formerly fabricated by an outside source. Carrying an inventory ranging from 5 to 25 trays for each of fifteen ironer models was necessary. Using the Verson Press Brake, trays are now formed as needed, eliminating inventory and reducing the cost per piece.

Although this Verson Brake has been operated only 80 working hours since installation, Chicago Dryer Company reports the machine has already paid for itself in labor savings, convenience and increased production.

A Verson Press Brake may be the answer to your metal forming problems. It costs nothing to investigate. Call or write, today.

A Verson Press for every job from 60 tons up.

212

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

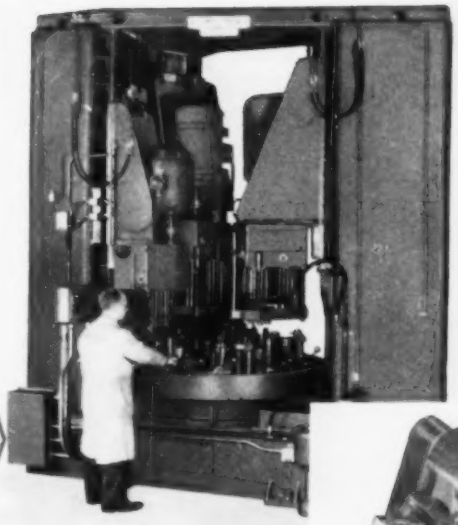
9316 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

KEARNEY & TRECKER *builds production*

MACHINE TOOLS FOR EVERY INDUSTRY

Since 1898 . . . Kearney & Trecker Customer Engineering Service — supported by an outstanding staff of engineers experienced in production milling machine design and application — combined with the finest and latest machine tools in an ultra modern plant is always ready to solve your production problems.

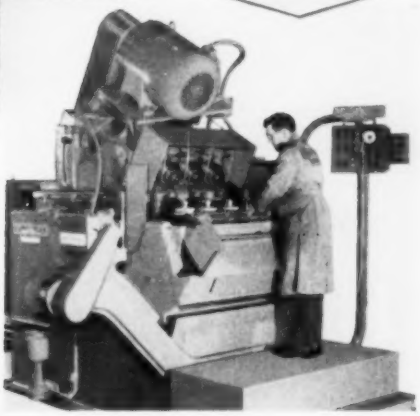


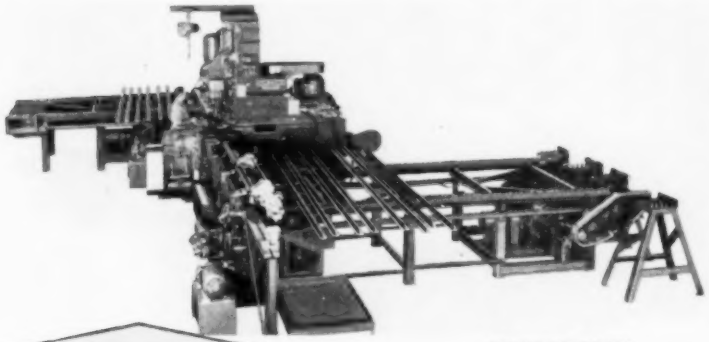
Oil Industry

automatic 4-spindle milling machine mills 4 rock bit cones *simultaneously*... in a trunnion-type fixture having 4 work-piece spindles. PRODUCTION — a constant flow of this expendable type tool to meet the steady demand.

Automotive Industry

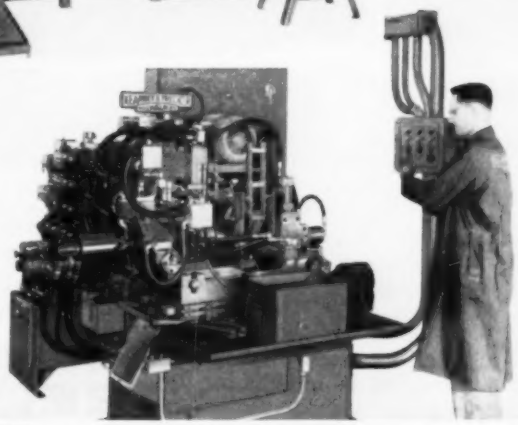
this 88 spindle, 3 vertical head machine performs drilling, chamfering, counterboring, trepanning, spot-facing, reaming and tapping operation on a differention case and cover. PRODUCTION — 67 cases, 67 covers per hour.





Elevator Industry

12 spindle automatic transfer machine mills mating tongue and groove on ends of elevator guide rail-drills mounting holes in rail flanges—for continuous rail mounting. PRODUCTION—28 completely machined rails per hour—180% increase over old method.



Tool Industry

Flutes and shank squares are milled on tap blanks by this automatic machine. Tap blanks are hopper loaded and automatically unloaded. RESULT—greatly increased hourly production.

KEARNEY & TRECKER MILWAUKEE ®

Write for bulletin SMD-57 on your company letterhead.

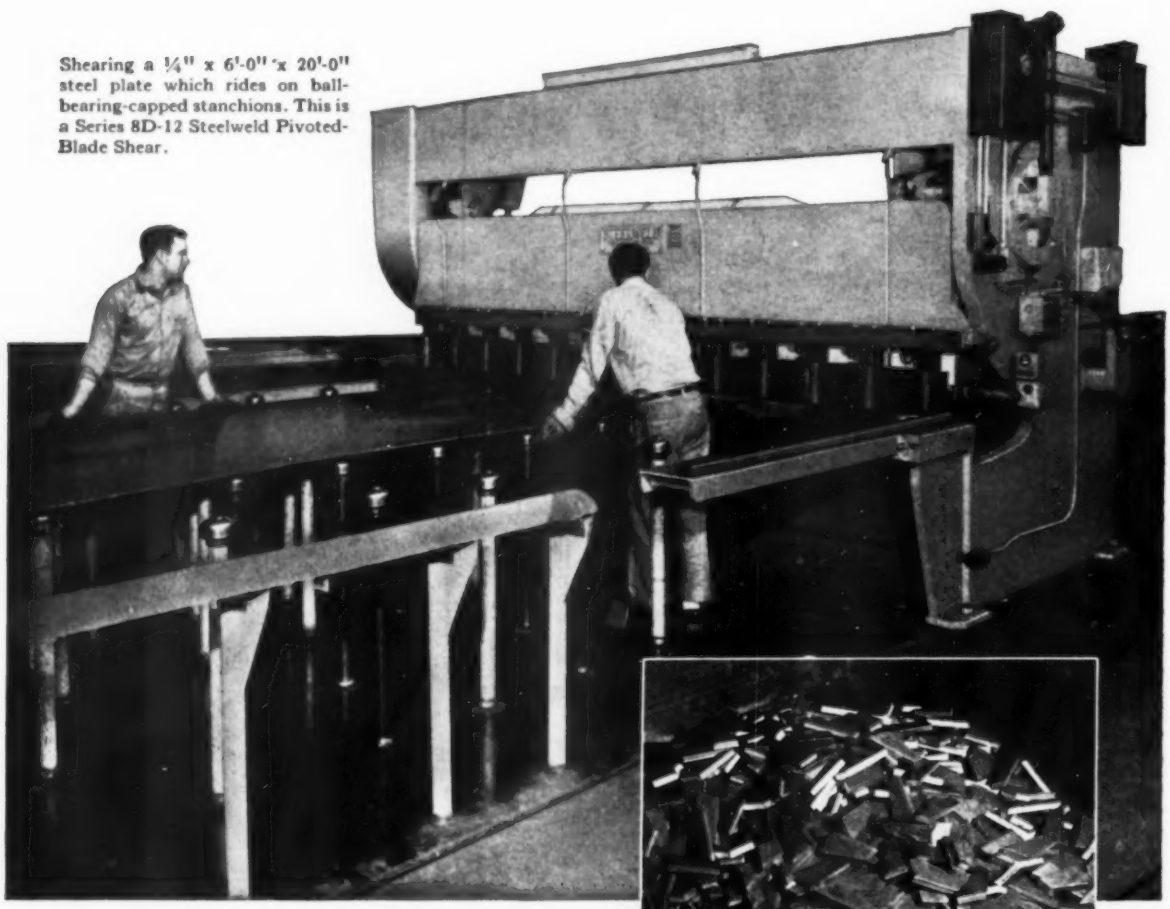
KEARNEY & TRECKER CORPORATION

Special Machinery Division

6786 W. National Avenue • Milwaukee 14, Wisconsin

STEELWELD SHEAR
Serves TOUGH JOBS Well

Shearing a ¼" x 6'-0" x 20'-0" steel plate which rides on ball-bearing-capped stanchions. This is a Series 8D-12 Steelweld Pivoted-Blade Shear.



A part of an order of 120,000 gussets cut on the shear.

FOR several years a Steelweld Shear has been in operation at the Drake Steel Supply Co., Los Angeles, California. Most of the time it has been worked on a 16-hour-a-day schedule. It is used for a wide variety of shearing, mostly on 3/16-inch and ½-inch steel plate.

The machine has proven itself on all sorts of shearing jobs. A particularly tough one was the cutting of 120,000 small odd-shaped gusset plates. These were of three sizes and cut three to six at a time of ½-inch steel. The work jarred the shear terrifically, but because of its heavy construction, did not affect it in any way.

Considering the volume of work and hard service, the knives hold up very well. They need be turned only about once every six months.

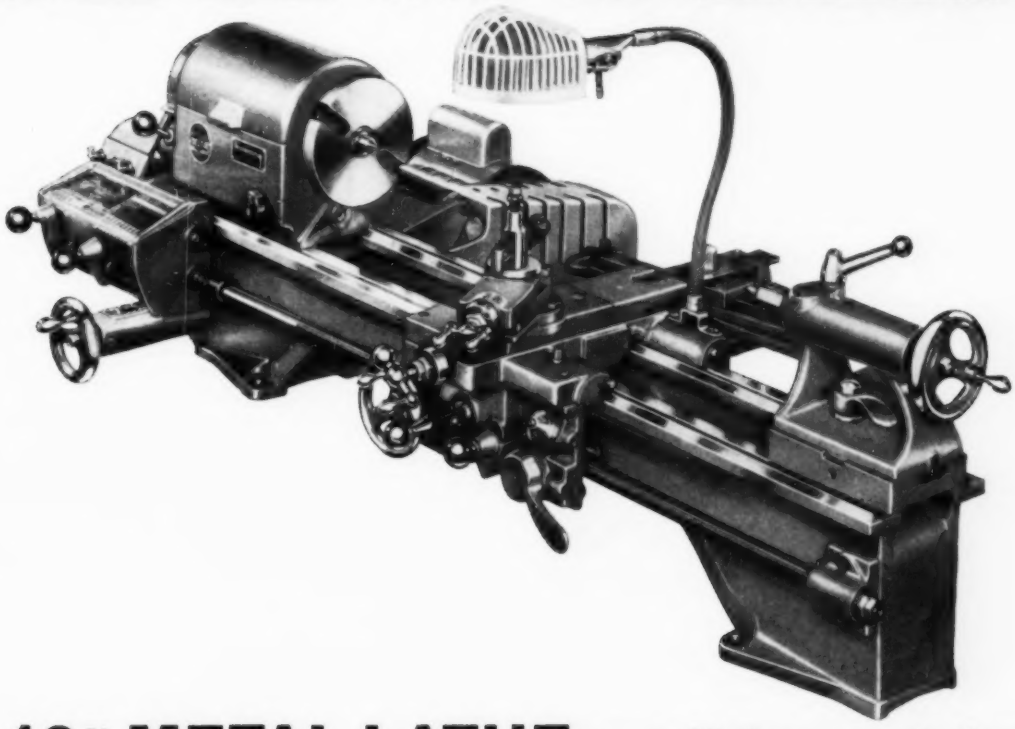
Write for free copy of catalog No. 2011

STEELWELD
Mechanical and Hydraulic
SHEARS PIVOTED BLADE

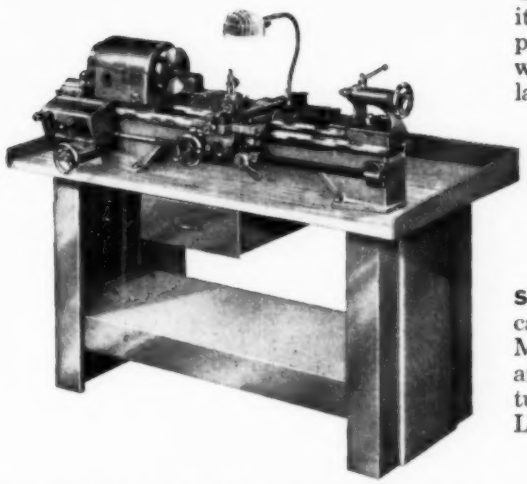
Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

THE CLEVELAND CRANE & ENGINEERING COMPANY • 1458 EAST 282nd STREET • WICKLIFFE, OHIO

NEW from DELTA



10″ METAL LATHE can't be matched for performance, capacity, or real value!



The many items of standard equipment *include* variable speed drive (complete with belts) and thread chasing dial at no extra cost. Specially designed, extra rigid Delta bench and complete line of accessories also available.

You'll like everything about this all-new Delta 10″ Lathe—its modern look, on-the-job performance, and the low price—just $645.00! Designed for industry, schools or home workshops, it fills the need for a safe, low cost, precision lathe with heavy-duty capacity.

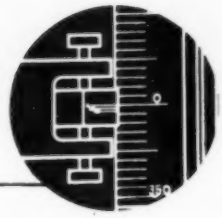
And you get this exclusive combination of Delta Quality features never before available on a lathe this size at comparable cost: variable speed drive, ¾″ collet capacity, massive, double row, precision ball bearing at the work load end of the spindle.

SEND FOR NEW LATHE CATALOG—Pictures, describes and catalogs the new 10″ lathe plus the complete line of Delta Metal Lathes and full range of accessories. For *free* copy and list of Delta Lathe Dealers write: Rockwell Manufacturing Company, Delta Power Tool Division, 618E N. Lexington Ave., Pittsburgh 8, Pa.

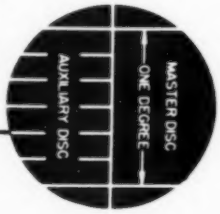
DELTA METAL LATHES
another fine product by
ROCKWELL

WORLD'S MOST ACCURATE DIVIDING HEAD

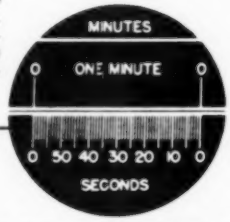
Graduated hand disc for initial rough setting to nearest increment of 20 minutes.



Rotary master disc and fixed auxiliary disc have lines diamond scribed within .000025" of true position. Visible through 40 power scope.

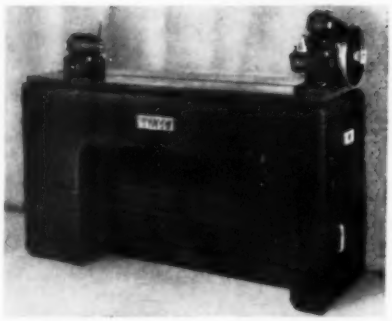


Upper micrometer thimble is divided into 10 minutes of arc. Lower barrel has divisions of both 60 and 10 spaces per minute.



Vinco Optical Master Inspection Dividing Head

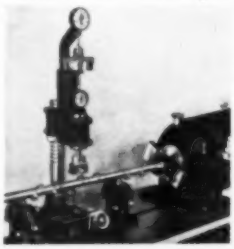
For 20 years, the national standard for precision angular measurements and the most accurate industrial turntable. **GUARANTEED ACCURACY:** spindle runout, 25 millionths of an inch (average 15 millionths). • **TOTAL ACCUMULATED ERROR:** 2 seconds of arc (± 1 second). *One second is 1,296,000th part of a circle.* • **MEASURING INCREMENTS:** any required amount of degrees, minutes and seconds. • **APPLICATIONS:** measurement of gear and spline spacing, bore relationships, calibration of index plates, involute and master involute profiles, inspection of any type cam, etc. Years of normal usage will not, and have not altered the extreme accuracy of these instruments.



Standard optical dividing heads are available with 20" x 40" or 20" x 72" surface plates of either cast iron alloy or granite. The heavy duty model has a surface plate, cast iron or granite, 36" x 72". Surface plates are hand scraped, have a flatness accuracy of .0002" and are provided with a precision keyway for perfect alignment of tailstock to dividing head.

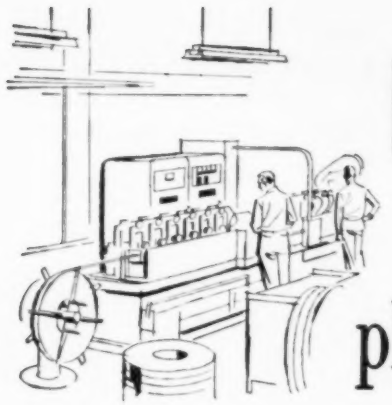
NEW VERTICAL SPINDLE OPTICAL DIVIDING HEAD

This new instrument embodies the same proven design as the popular standard model, is equipped with a 30 inch diameter turntable and a swivel measuring head. It accommodates larger parts in horizontal position and performs essentially the same inspection functions as the standard model. The measuring head provides readings in increments of .0001".



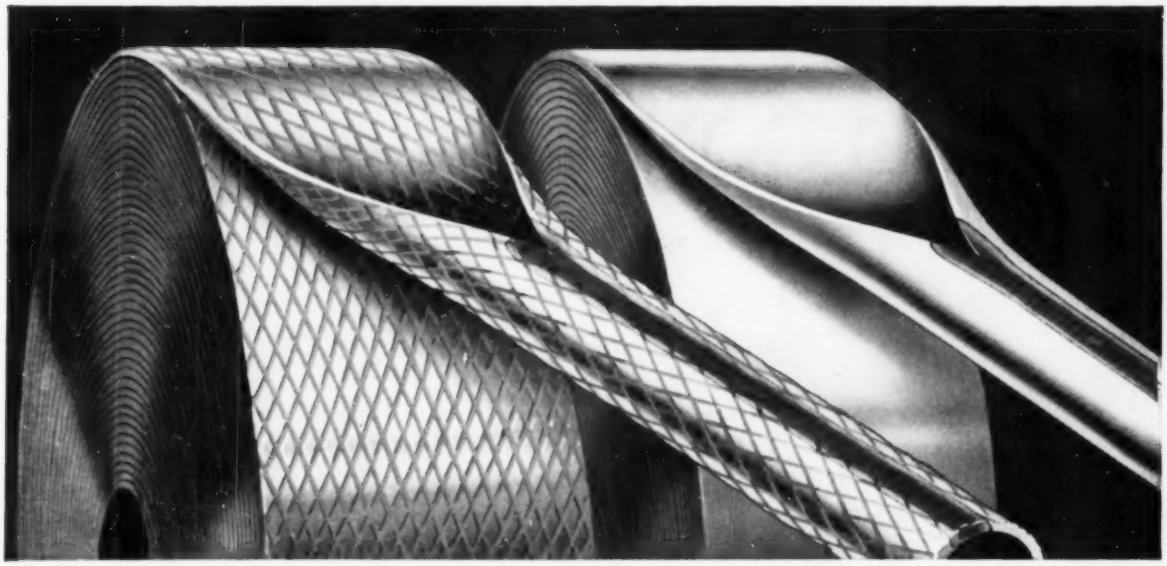
CAM RISE GAGE measures linear rise or fall of peripheral cams and camshafts within .0001", is available in two sizes, 6" or 9" swing. Special adaptations can be made.

VINCO CORP., 9111 Schaefer Hwy., Detroit 28, Mich.



Now... Aluminum Tubing... plain or patterned...Welded

with TOCCO* *High-Frequency Heating*



Quaker State Metals Company, leading fabricator of aluminum building products, recently installed a 25 kw, 450,000 cycle TOCCOtron vacuum tube oscillator for continuous welding of aluminum tubing. Both plain and patterned strip, anodized or untreated according to end-use requirements, is continuously welded. Diameters vary from ½" to 1" O. D. and wall thicknesses from .024 to .064".

The weld is absolutely uniform throughout the entire length, assuring a dependable, strong bond. The whole operation is so smooth and quiet, you hardly know it's running.

Aside from the perfect weld, for the ultimate in product quality, TOCCO Induction Welding, being a completely automatic process, saves time and money over many conventional joining methods.

Remember, whether *your* products are of ferrous or non-ferrous metals, TOCCO can almost certainly save *you* time and money in heat-treating, brazing, welding, or hot forming operations.

***Mail Coupon Today*– NEW FREE Bulletin**

The Ohio Crankshaft Co. • Dept. B-5, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Heating".

Name_____

Position_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

CIRCLE 339 READER SERVICE CARD 221

PUSH BUTTON *Speed Selection*

from to in seconds

or to *any* intermediate speed, *instantly*

Just push a button and watch the large tachometer dial on the headstock!

It's that easy!

The work is done by a motor driven speed changer. It accelerates or slows the lathe to any desired speed in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds—200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe, moderate in price, with the versatility for toolroom, production or second operation jobs.

SHELDON *Variable Speed* PRECISION LATHES

Illustrated
WM56P
13" Swing- 34" Centers
Base Price F.O.B. Factory
$2146.00
Less Chip Pan and Electricals
Also available with 11" Swing

Write for

"Variable Speed" Circular and General Catalog showing . . .

- 10", 11", 13" and 15" SHELDON Precision Lathes (Bench, Pedestal and Cabinet types)
- 13" and 15" SEBASTIAN Geared Head Lathes
- SHELDON Milling Machines
- SHELDON Back Geared Shapers

SHELDON MACHINE CO., INC.
4234 N. Knox Ave. • Chicago 41, Ill.

CIRCLE 340 READER SERVICE CARD

TREPANS

- **Maximum Diameter—5/8 inch.**
- For fast-production, multi-spindle machines.
- Specially heat-treated, high speed steel.
- With back taper or radial relief.
- Made by specialists in the design of small tools.

WOODRUFF & STOKES CO.
INCORPORATED
Bldg. 32, 357 Lincoln St., Hingham, Massachusetts

CIRCLE 342 READER SERVICE CARD

The LINLEY JIG BORER

A Precision Tool — Compact — Simple To Operate

How long can you afford to tie-up large capacity borers for toolroom work? Linley Jig Borers, made specifically for the purpose, can handle all of your small precision jig boring—fast and efficiently. Investigate the possibilities in these Linley precision-producers . . . for more flexibility in your shop, for savings in money and machines.

Table Size: 7" x 17½"; Table Travel: 6½" x 10".

IT WILL PAY YOU TO INQUIRE — WRITE NOW!

LINLEY BROTHERS CO.
664 STATE ST. EXT. • BRIDGEPORT 1, CONN.

PRODUCTION METHODS at GRAFLEX

Here are details of unique precision production methods at Graflex, Inc., Rochester. An *American Machinist* Special Report. 20 pages, illustrated, 25 cents a copy.

READER SERVICE DEPT.
American Machinist
McGraw-Hill Building
New York 36, N. Y.

"Far Superior to its Competition"...

. . . states Mr. Creighton Blanchard, toolroom superintendent at New Hampshire Ball Bearings, Inc., Peterborough, New Hampshire

THE NEW, IMPROVED THOMPSON TYPE D HAND FEED

SURFACE GRINDER

is winning enthusiastic approval wherever precision work is required

Here's what Mr. Blanchard has to say about the new Type D machine:

"We have three grinders in our toolroom—a Thompson and two competing machines. In our general toolroom grinding, especially on carbide and hard metals, we find the Thompson Type D so superior that we have recently purchased another Thompson just like it. All our precision work goes on the Thompson."

Compare these features

- Steel roller anti-friction slides eliminate ball creep and increase rigidity.
- 14" standard vertical capacity under 7" wheel at no extra cost with no loss in vertical capacity when using wet attachment.
- Solid support through entire length of bearing quill assures extra fine finish.
- 5 inch table movement per turn of handwheel improves quality of finish and speeds up operations.
- No backlash, anti-friction ball nuts and screws on cross feed prevent wheel from creeping away from work in shoulder grinding.
- Swing-out stop for table dog contact permits quick movement to wheel dresser.
- Immediate delivery available.

Send for descriptive literature on the new Thompson Type D Grinder.

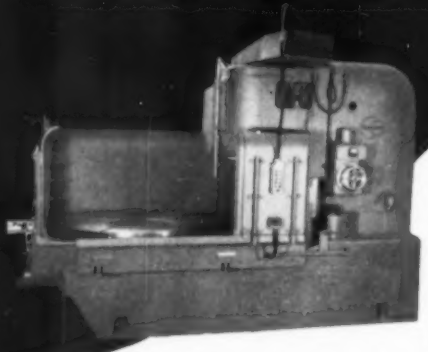
THE THOMPSON GRINDER CO.
SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

Thompson SURFACE GRINDERS

CIRCLE 344 READER SERVICE CARD

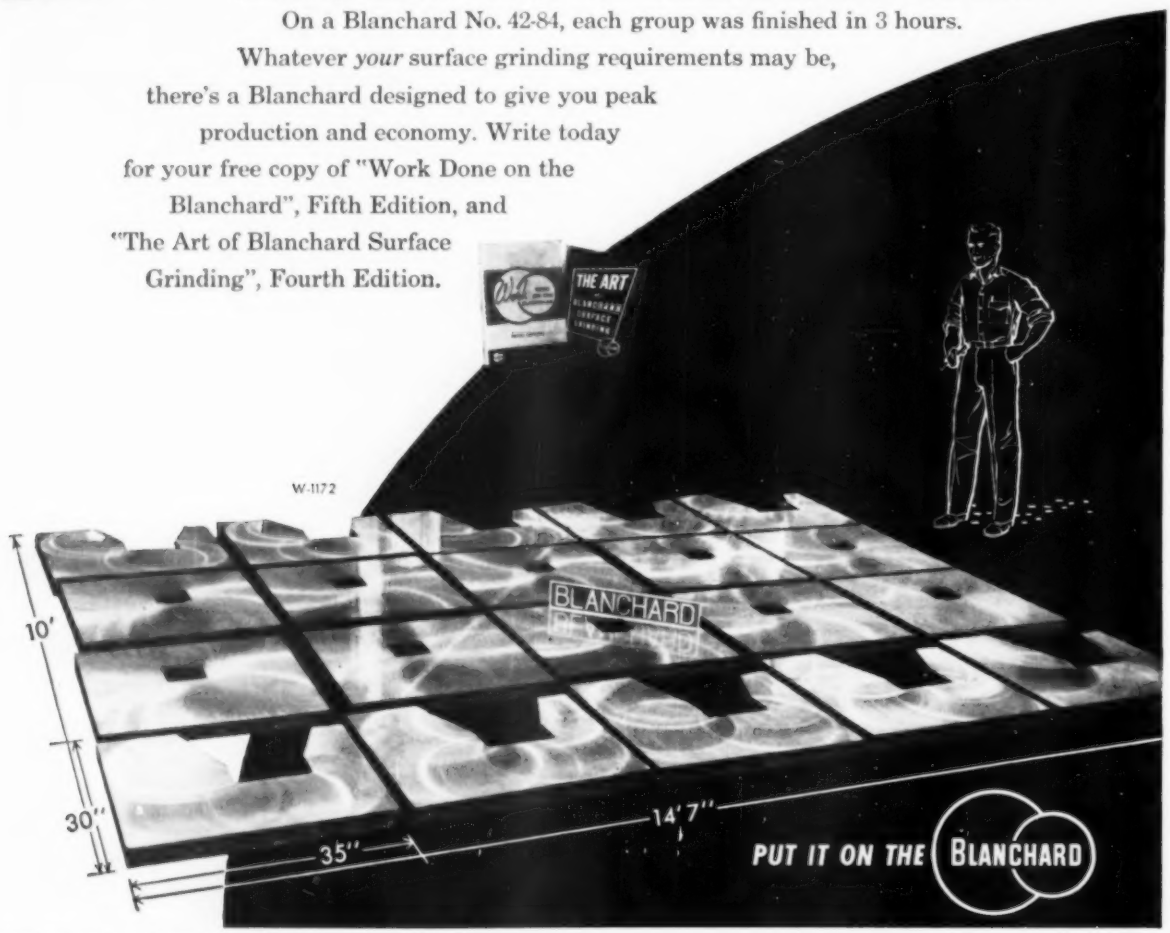
Grinding Perfection is Assured When You "Put it on the Blanchard"



V-517

The production speed and precision of modern Blanchard Surface Grinders are illustrated by this interesting job, involving 20 plates measuring 30″ x 35″ x 3″. Ten of them had openings of 6½″ x 4″, the other ten had openings of 11″ x 20″. Each group of plates required stock removal of 5/32″ from two sides, with flatness of .003″. On a Blanchard No. 42-84, each group was finished in 3 hours.

Whatever *your* surface grinding requirements may be, there's a Blanchard designed to give you peak production and economy. Write today for your free copy of "Work Done on the Blanchard", Fifth Edition, and "The Art of Blanchard Surface Grinding", Fourth Edition.



W-1172

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

Reduce Costly Wear on Air Equipment

Pipe scale, pipe dope, condensate, emulsified and deteriorated compressor oil — all damaging to connected air equipment — are inherently present in all compressed air systems. Provide for the efficient removal of these contaminants and assure top performance from air actuated devices by specifying a Norgren Air Line Filter in your design.

- **99 Models to choose from**—⅛", ¼", ⅜", ½", ¾", 1", 1¼", 1½" pipe sizes.
- **Choice of 4 Filter Elements**—74, 64 or 25 micron... 5 micron available in some sizes.
- **Transparent or Metal Bowls**
- **Wide Operating Pressure Range**—Top efficiency at pressures as low as 5 psi—as high as 250 psi for metal bowl type.
- **Wide Operating Temperature Range**—Metal bowl models extend temperature range to 200° F.
- **Automatic or Manual Drain**—Automatic drain eliminates maintenance cost for draining manually.
- **Abrasive Solids and Corrosive Liquids**—are removed from air lines, reducing equipment wear, repair and replacement costs.

Norgren Manual Drain Air Line Filter (Norgren Automatic-Drain Air Line Filter is illustrated above.)

For complete information, call your nearby Norgren Representative listed in your telephone directory—or WRITE FOR DESCRIPTIVE LITERATURE.

If it's Norgren... It's Dependable.

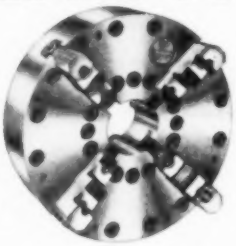
C. A. NORGREN CO.

3436 SO. ELATI STREET • ENGLEWOOD, COLORADO

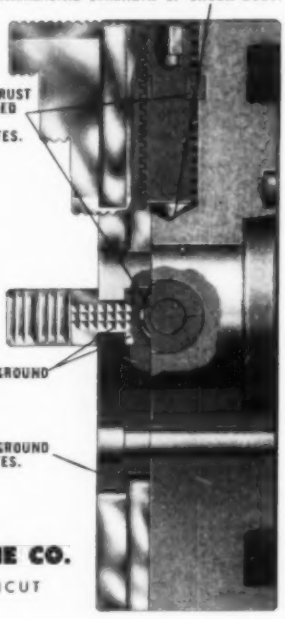
CIRCLE 346 READER SERVICE CARD

dependable...

Whiton HARDENED PLATE CHUCKS for High Precision Work



In high-precision, low-cost turning operations the **right** chuck for the lathe and the job is of utmost importance. Whiton's Independent 4-jaw chuck — with more than 100 years experience behind it — features jaw slots formed by separate plates hardened and finish ground **before** mounting on the chuck body.


SCREW CHAMBER NOT BORED THROUGH TO CENTER HOLE — INCREASING STRENGTH OF CHUCK BODY.
FULL CIRCLE THRUST BEARING RETAINED IN BODY BY SEGMENTAL PLATES.
HARDENED AND GROUND JAW SLOTS.
HARDENED AND GROUND SEGMENTAL PLATES.

The Right Chuck FOR THE JOB!

The **Right** Chuck for the job is a Whiton! Whiton hardened plate type chucks available from 8" to 18" diameter for American Standard Spindle Noses: Types A, D, & L. Furnished with style No. 6 American Standard Tongue and groove or solid type reversible jaws.

Complete technical information available on request.

THE WHITON MACHINE CO.
NEW LONDON, CONNECTICUT

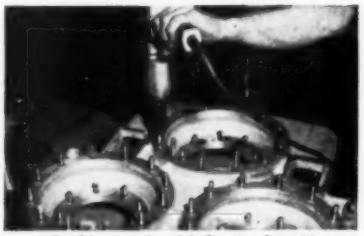
CIRCLE 347 READER SERVICE CARD

ADDITIONAL MARKET DATA AVAILABLE FROM THE AMERICAN MACHINIST INVENTORY

Statistics collected for American Machinist's unique census of metalworking equipment have been tabulated on IBM cards. Special runs to fit the inventory to your needs are now possible for a nominal fee. Write for complete information.

American Machinist Market Dept.
330 W. 42nd ST., N. Y. 36, N. Y.

LOCTITE secures 98 studs against vibration



Locking studs with Loctite Liquid Sealant in transmission unit of jet aircraft starter.

Cast aluminum gear cases for jet aircraft starters are machined and assembled at The Black Rock Manufacturing Company, successor to Reed-Prentice Corp., Bridgeport, Connecticut. The 98 studs used in the unit are treated with LOCTITE Sealant to secure them against vibration. The jet starter units receive an input of 2500 rpm and develop output of 5000 rpm to each of three flexible shaft connections. LOCTITE was selected for this application since it provides a greater prevailing torque than any mechanical locking device. The locking strength of LOCTITE is not affected by the wide temperature ranges the unit encounters in arctic to tropic operation.

Stud thread is hand-dipped in shallow tray of Loctite, then positioned in casting for tightening. Three sizes of steel studs are used: ¼"-20, ⅜"- 18 and ⅜"-16.

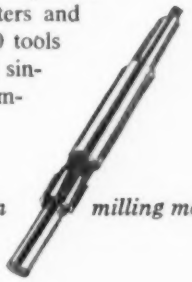
Two ½"-14 thread inserts are treated with Loctite to lock and seal in casting. The inserts provide non-abrading threads for removable oil-drain plug.

LOCTITE Sealant is a thin liquid that hardens into a tough heat and oil-resistant plastic bond when confined between closely fitting metal parts. No amount of vibration will shake loose a LOCTITE treated threaded fastener, yet ordinary tools may be used to remove the part. LOCTITE is used to hold bearings, bushings, or hardened sleeves to shafts without press fit; seals joints against high pressure fluids. Write for literature and free sample.

LOCTITE® SEALANT
AMERICAN SEALANTS COMPANY
121 Woodbine St., Hartford 6, Conn.
See LOCTITE Booth 1653 Design Engr'ng Show

CIRCLE 349 READER SERVICE CARD

Today O K Tool offers one of the most comprehensive lines of milling cutters in the industry. It consists of many "firsts": the first single-point tools with interchangeable tool bits for lathe, planer, shaper and boring mill jobs; the first milling cutters with tapered and serrated blades; the first shankless single-point tools. Recently these have been supplemented with quick-change wedge-type milling cutters and over 750 kinds and sizes of solid tools, making a total of over 3000 tools designed to better serve machine shops everywhere. Free catalogs: ☐ single point tools, ☐ milling cutters, ☐ solid cutters. The O K Tool Company, Inc., 400 Elm Street, Milford, New Hampshire.

OK *modern milling* *cutters for* *modern*  *milling machines*

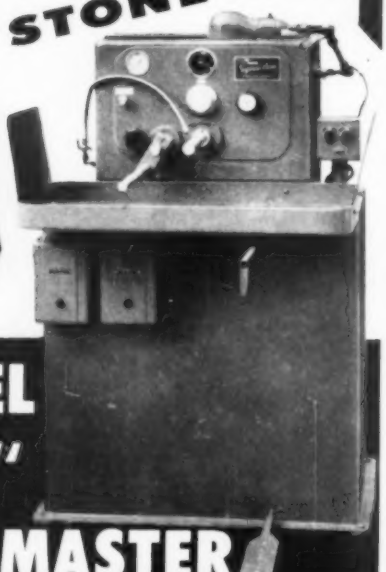
Let Superior Help You—

SHORTEN HONING TIME

ACHIEVE A BETTER FINISH

CUT PRODUCTION COST

EXTEND STONE LIFE



MODEL "HM" HONEMASTER

Adjustable hydraulic system assures constant stone pressure, continuous cutting with no fall off due to wear or stock removal.

Infinitely variable speed (250 to 1150 rpm.).

Single control dial shows when first piece is coming to finish size. Set, then thereafter just compensate for stone wear.

Hydraulic clutch and brake.

Stocked in all principal cities. Send for details and prices.

SUPERIOR HONE CORPORATION

1607 ELRENO STREET • ELKHART, INDIANA

CIRCLE 351 READER SERVICE CARD

NOW

On-the-Job Gaging with Accuracy to .00002"

Threadwell

DUAL RANGE S.I.

ELECTRONIC COMPARATOR

- Two ranges selected by a simple turn of the control knob
- Coarse range 200:1, fine range 2000:1
- Lifetime steel tipped gaging unit
- Perfect repetition not found in units costing much more
- No sensitivity to temperature change; allows use in any part of plant or shop
- Operating pressure of less than 3 ounces
- Work is slid under the gaging head tip
- Interchangeable tips for various applications
- Flexible zero adjustment on the most sensitive range. Gaging head can be set up in a simple split clamp without need for fine mechanical adjustment

See your Threadwell Distributor or write for free bulletin

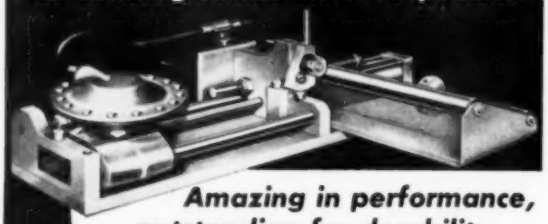
Threadwell

THREADWELL TAP & DIE CO.
Greenfield, Mass.

CIRCLE 352 READER SERVICE CARD

Ses-Matic AIR FEED

for feeding coiled stock to presses



Amazing in performance, outstanding for durability . . .

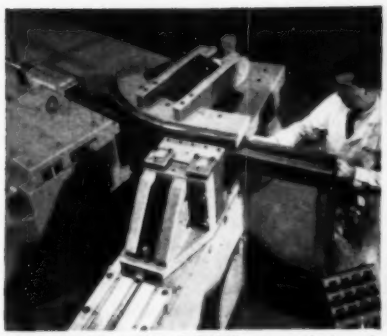
• Packed with power, speed, simplicity, accuracy . . . the Ses-Matic AIR FEED handles a wide range of press feeding jobs—mounts directly to the side of the press . . . simple adjustments when changing from one job to another. Models available for most stock widths, feed stroke lengths, and stock thicknesses up to .187 inches. Unit can be moved from press to press.

Write for catalog on Ses-Matic Air Feeds, Cradles, Straighteners and other coil handling equipment.

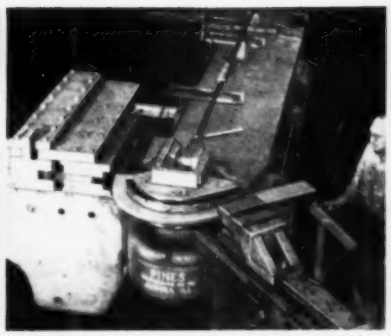
Ses-Matic

SPECIAL ENGINEERING SERVICE • INC.
8167 Livernois • Detroit 4, Mich.

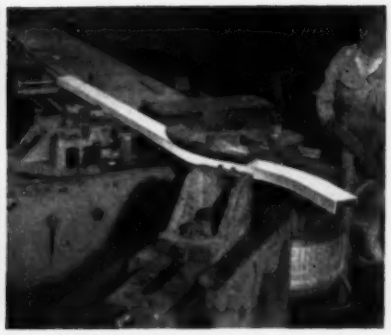
CIRCLE 353 READER SERVICE CARD



HEAVY RECTANGULAR TUBES—accurately formed on Pines Model 4 on a 24" inside radius for air cushion assembly on heavy duty truck chassis. Material is 4" x 5½" x .200" wall.



SOLID STEEL BEAMS—cold edge bending of 5½" x 1¼" steel bars on Pines Model 4 replaces hot bending on dozer, produces more accurate parts at lower cost for road machinery manufacturer.

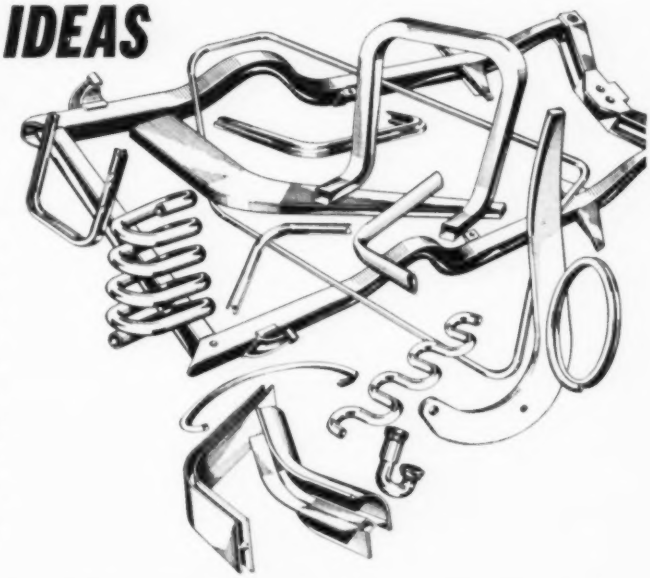


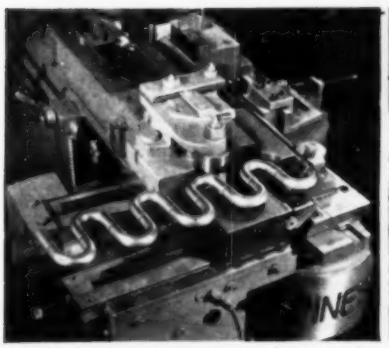
ALUMINUM CHANNELS—rugged machine construction and tooling on Pines Model 3 Machine cold forms 4" x 1¾" x .320" aluminum channel without wrinkling or distorting. Spring-back is controlled by simple machine settings.

FOR COST CUTTING IDEAS

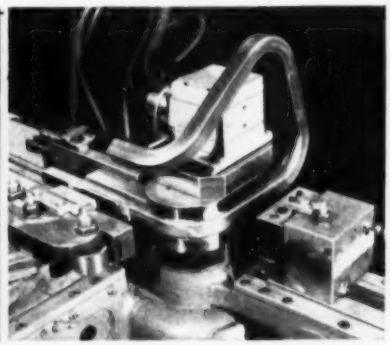
INVESTIGATE PRODUCTION BENDING THE "PINES-WAY"

When you have a production job requiring the cold forming of parts from round, square, rectangular, extruded, or hollow stock to an even radius; or to different angles, we suggest you investigate the cost cutting advantages of production bending the Pines-way. The examples shown here illustrate a few of the many different and varied applications which are today profitably produced on Pines machines. Cold bending is a fast, accurate, easy to control metal forming process that is today more profitably applied in the production of an ever increasing variety of products. Call on Pines engineers for assistance without obligation on any specific job.

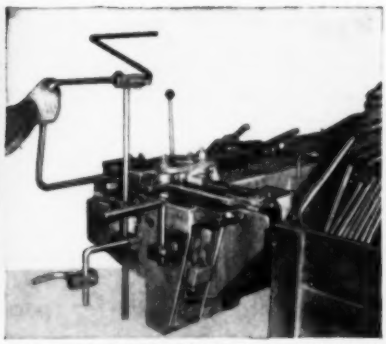




COPPER SERPENTINE BENDS—¾" O.D. x .035" copper tubing is rapidly formed on this Model ¾ into serpentine coils on a 1" clr. A simple gang-slitting operation produces 180° return bends.



WRINKLE-FREE SQUARE TUBE BENDING—Model 1 Machine, equipped with flexible mandrel and self-opening bending form, produces top quality office and hospital equipment at speeds of 250 bends per hour.



FAST ROUND-TUBE BENDING—Pines Model ¾ Machines speed production of tubular dinette and lawn furniture. Fast, automatic cycling and accurate progressive bending produce 600 to 900 bends per hour.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

672 WALNUT • AURORA, ILLINOIS

WRITE FOR FREE DATA SHEETS

To keep abreast with bending, write for free copies of "Pines News" — gives complete data on new production applications.

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

New Dual Purpose Synthetic Grinding and Cutting Compound

only synthetic that incorporates extreme pressure properties and leaves oily film on work

DUAL PURPOSE

Kerns' new SGC-6560 Compound will cover more applications than any product yet introduced to the metalworking industry. Scientifically developed for all grinding operations, Kerns' exclusive formulation contains excellent anti-weld qualities plus superior E. P. characteristics that make it equally suitable for cutting operations.

LONGER LIFE

Tests show 4 times the sump life of other products . . . this long life saves cash dollars and assures a minimum of downtime plus increased production.

CLEAN . . . SAFE

Kerns' SGC-6560 completely eliminates rancidity and skin irritation. Being transparent when in solution, it produces cleaner work and provides superior rust protection. It will not dry out on gauges, ways or moving parts, and will never cause sticking or impair operation of machines.

MEMO BILLING TRIAL BASIS

Try it . . . we supply material for production test . . . no formal invoice rendered unless completely approved in production. Remember . . . with Kerns you get compounds tailored to *your* operation.

Write for further information and Technical Data Sheet SGC-6560.

QUALITY SERVICE

L.R. Kerns Co.

2659 EAST 95th STREET • CHICAGO 17, ILL.

Subsidiary Plant

KERNS PACIFIC CORPORATION

630 N. Batavia Street • Orange, California

JUST OUT!

DIMENSIONAL CONTROL IN PRECISION MANUFACTURING

Thoroughly covers principles and techniques of dimensional control as applied in production machining to increase production and reduce unit costs. Stresses importance of detailed planning in preparing parts for production. Shows application of machining principles and their attendant dimensional controls as well as development of a production process from the engineering standpoint. **By John L. Gadzala, Boeing Airplane Company. 205 pp., 156 illus., $7.50**

PRODUCTION PLANNING AND INVENTORY CONTROL

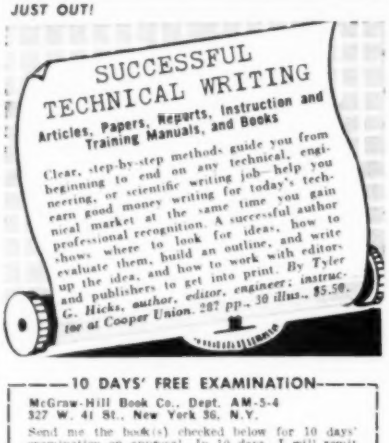
Explains new concepts in processes of inventory control and production planning along the lines of operations research thinking. Discusses policies and costs that affect inventory and production planning decisions; shows how these elements are balanced to arrive at a sound inventory policy and effective methods for carrying it out. **By John F. Magee, Arthur D. Little, Inc. 330 pp. illus., $7.50**

JUST OUT!

MACHINE TOOLS FOR ENGINEERS

Gives the engineer and designer a broad understanding of production tools and processes. Second edition describes, analyzes, and compares various machine tools so that the most efficient and economical processes can be used for a particular design. **By Charles R. Hine, Zak Machine Works. 2nd Ed., 435 pp., 362 illus., $7.75**

JUST OUT!


SUCCESSFUL TECHNICAL WRITING
Articles, Papers, Reports, Instruction and Training Manuals, and Books
Clear, step-by-step methods guide you from beginning to end on any technical, engineering, or scientific writing job—help you earn good money writing for today's technical market at the same time you gain professional recognition. A successful author shows where to look for ideas, how to evaluate them, build an outline, and write up the idea, and how to work with editors and publishers to get into print. By Tyler G. Hicks, author, editor, engineer; instructor at Cooper Union. 287 pp., 30 illus., $5.50.

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., Dept. AM-5-4
327 W. 41 St., New York 36, N.Y.

Send me the book(s) checked below for 10 days' examination on approval. In 10 days, I will remit for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if you remit with coupon; same return privilege.)

- ☐ Gadzala — **Dimensional Control in Mfg.** — $7.50
- ☐ Magee — **Prod. Planning & Inv. Control** — $7.50
- ☐ Hines — **Machine Tools for Engineers** — $7.75
- ☐ Hicks — **Successful Technical Writing** — $5.50

PRINT NAME

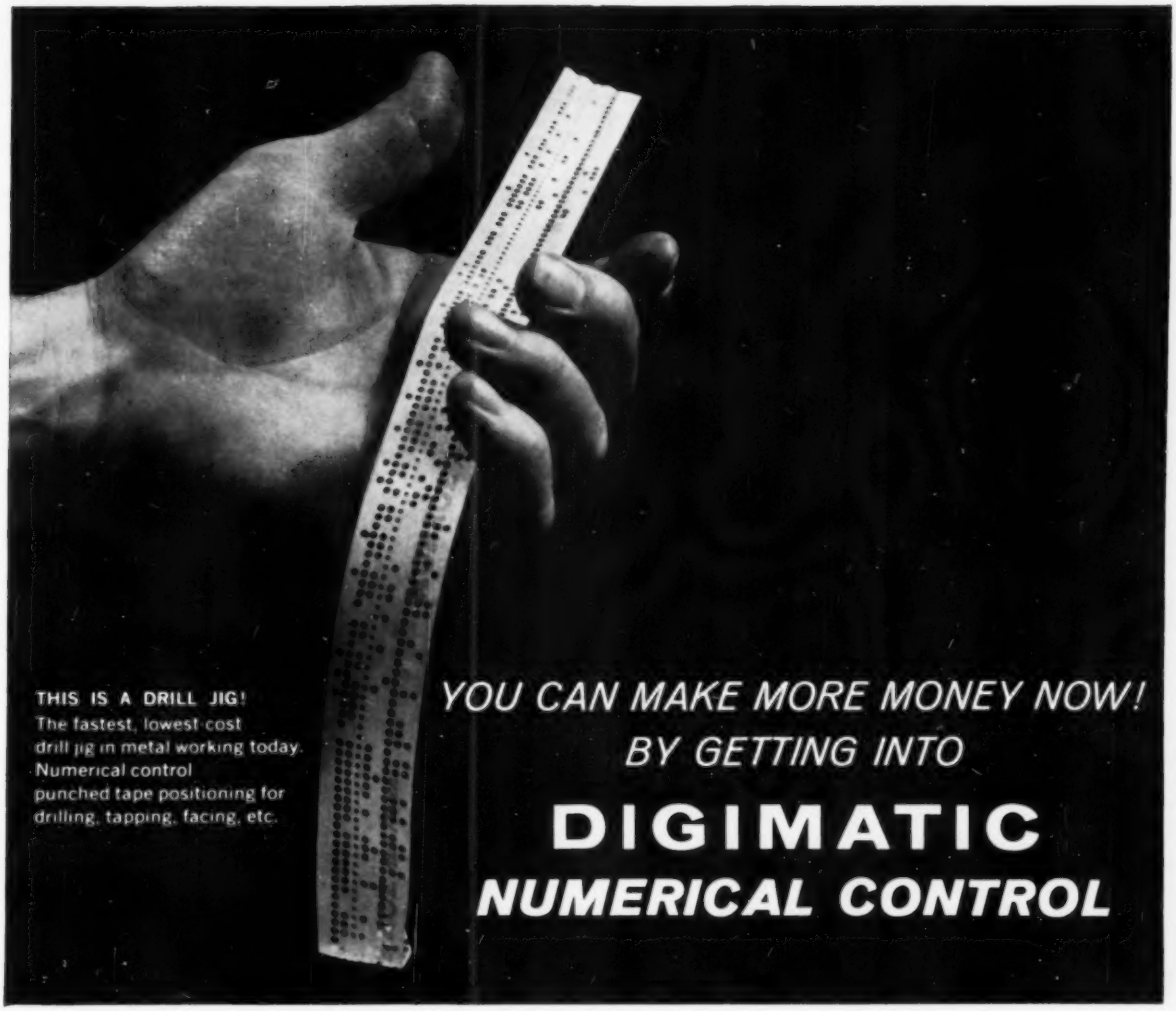
ADDRESS

CITY ZONE STATE

COMPANY

POSITION

For price and terms outside U.S.A. write McGraw-Hill Int'l., N.Y.C. AM-5-4


THIS IS A DRILL JIG!
The fastest, lowest-cost drill jig in metal working today. Numerical control punched tape positioning for drilling, tapping, facing, etc.
YOU CAN MAKE MORE MONEY NOW!
BY GETTING INTO
DIGIMATIC
NUMERICAL CONTROL

If you make a variety of parts, in small quantities (1-2000), and often have engineering changes—DIGIMATIC® 202 by Stromberg-Carlson can drastically reduce the cost per part. Here's why.

1. Reduces lead time—because tapes can be made much faster than drill jigs.

2. Cuts down on inspection time—because tape controls are *exactly* repetitive. There's no fatigue factor.

3. Shorter set-up time—only simple holding fixture required.

4. Eliminates scrap and rework due to human error.

In a typical application, the total cost per part for the production of forty parts was reduced from $7.87 to $3.29.

But more important, an engineering change order was effected in 15 minutes at a cost of $1.15 as opposed to conventional retooling costs of $38.40. A saving of 97%!

Every factor that would influence this cost has been considered. The cost of additional floor space, insurance, power, etc., and amortization required over the present machine tool for the DIGIMATIC 202 Control System is included. Complete details and photographs furnished on request.

The only complete, standard system. The DIGIMATIC Control System includes all equipment necessary for numerical control operation. It includes: *Special Punch Tape Preparation Unit* that is as simple to operate as an adding machine. No complicated computer language to learn. *Control Console*—compact unit, operator maintained, with shop-proven reliability. *Servo Table*—can be adapted to any existing machine in one day. Automatically positions work on ball bearing ways accurately and rigidly within 1½ seconds per hole.

Write for free 12-page booklet, "**DIGIMATIC Model 202**" containing complete details and illustrations. Also—movies shown at your shop or plant on request.

® DIGIMATIC IS OUR TRADEMARK

STROMBERG-CARLSON ELECTRONIC CONTROL SYSTEMS
A DIVISION OF GENERAL DYNAMICS CORPORATION • 1491 N. GOODMAN STREET • ROCHESTER 3, N. Y.

S-C | GD

NOW The Most Accurate-Versatile ROUNDNESS GAGE

Cleveland
INDI-RON* ultra precision Roundness, Concentricity and Squareness Gage.

★ Measures to Three Millionths Accuracy
Roundness—any diameter, I.D. or O.D.
Concentricity—any diameters, I.D. or O.D.
Squareness—any surface to any axis
Flatness—any face or flange

★ Suitable for Laboratory or Production
Simple to operate
Parts easily centered and tilted
Permanent Polar Chart record
Scales—Thousandths, Tenths and Millionths

★ NO MAINTENANCE PROBLEMS
Spindle-sealed—no maintenance
Proven drift free gaging equipment
Protector Tip* equipped gage head

other CLEVELAND PRECISION INSTRUMENTS

INDI-AC Ultra-Precision Electronic Height Gage
INDI-AC, Jr. Transistorized Indicator
MICRO-AC - Electronic Micro-Comparator
ROUGHNESS METER - For Surface finish measurement
PAR-AC - Electronic Production Gage
AU-MAC - Automatic Machine Control and Positioning Systems

Ask for a demonstration and see why CLEVELAND Gages give you more.

*Patent Applied For.

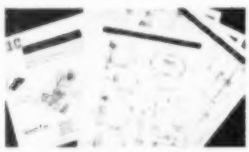
Cleveland INSTRUMENT COMPANY
6220 East Schaaf Road • Cleveland 31, Ohio

CIRCLE 358 READER SERVICE CARD

FREE
416-PAGE CATALOG

Lists over 8,000 Precision Instruments, Parts and Components.

From stock! Complete with Drawings, Full Specifications and Prices.



FREE
14-Piece
"DESIGN-AID" TEMPLATE KIT
14 actual size templates, created to assist you in the design and development of specific mechanical systems.

Send for FREE Catalog and "Design Aid" Today.

PIC DESIGN CORP.
Subsidiary of BENRUS WATCH COMPANY, Inc.
477 Atlantic Avenue
East Rockaway, L. I., N. Y.

The production man's guide to

Fastening Devices

Knowing how to put a product together is one of the keys to efficient production. Quick, inexpensive machining and forming techniques are wasted if slow, cumbersome and inefficient assembly methods are used. This Special Report summarizing typical mechanical fastening devices will help you select a fastener that will lead to a more dependable, more economical product.

16 pages, fully illustrated — 35 cents per copy

Reader Service Department

American Machinist

McGraw-Hill Building New York 36, N. Y.

SEARCHLIGHT SECTION

ADVERTISERS' INDEX AND BUYERS' REFERENCE

Listed below are used, surplus new and rebuilt machine tools or services as advertised in this section.

The numbers after the advertiser's name, indicates the products or services offered by the advertiser.

2. Automatics
3. Balancing Machines
6. Boring Mills
7. Broaching Machines
9. Centering Machines
10. Chucking Machines
16. Drilling & Reaming Machines
23. Gear Cutting Machines
24. Grinding Machines
29. Lathes
33. Milling Machines
37. Planers
41. Presses
48. Saws
51. Shapers
56. Threading & Tapping Machines

ADVERTISER	PAGE NO.	KEY TO PRODUCTS OR SERVICES
Eastern Machinery Co.	234	16, 24
Hyman & Sons, Joseph	233	41
Midwestern Machinery Co.	234	2, 6, 7, 16, 24, 29
Miles Machinery Co.	233	3, 9, 10, 23, 33, 37, 48, 51, 56

SEARCHLIGHT Equipment Locating SERVICE

"No Cost or Obligation"

This service is aimed at helping you, the reader of "SEARCHLIGHT," to locate rebuilt and used machine tools and equipment. Not currently advertised. (This service is for USER-BUYERS only) No charge or obligation.

How to use: Check the dealer ads to see if what you want is not currently advertised. If not, send us the specifications of the equipment and/or components wanted on the coupon below, or on your own company letterhead to

SEARCHLIGHT EQUIPMENT LOCATING SERVICE
c/o American Machinist
Classified Advertising Division, P.O. Box 12, N. Y. 36, N. Y.

Your requirements will be brought promptly to the attention of the equipment dealers advertising in this section. You will receive replies directly from them.

Searchlight Equipment Locating Service, c/o Classified Advertising
AMERICAN MACHINIST, P. O. Box 12, N. Y. 36, N. Y.

Please help us locate the following equipment:

.....

.....

.....

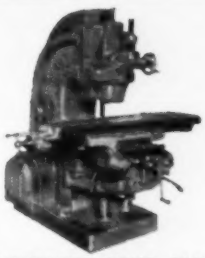
NAME .....

TITLE ..... COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

5/4/59



MODERNIZE YOUR PLANT WITH MILES REBUILT TOOLS

This No. 3 KM Kearney & Trecker dial-type vertical milling machine is typical of the fine machine tools available at Miles. Completely rebuilt to new tool tolerances and ready to go. Price $9500.

BALANCER. Model 2EO Tinius Olsen, 1948
BORER. No. 1212 Excell dbl. end (2)
BORING MILL. 3¾" bar No. 5 Defiance, 1942
BORING MILL 4" Universal Tri-Way 1000 RPM
BORING MILL. 60" Gisholt vert. PRT
CENTERING MACHINES. Nos. 53 & 56 Sundstrand up to 72" between centers
CHUCKER, 675 New Britain late
GEAR HOBBERS. No. 3 and Type A Barber-Colman, Late
GRINDERS, C'LESS. No. 12 Landis, 1947
GRINDER, CYL. 4" x 12" No. H. Landis, 1948
GRINDERS, CYL. 20" x 72" Landis, 1948
GRINDER, INT. No. 271 Heald size matic 1951
GRINDER, INT. 72AS Heald Univ., Hydr.
GRINDER, INT. No. 74 Heald Hydr., 1941
GRINDER, SURF. 8" x 24" x 36" DoAll hydr. 1948
GRINDER, SURF. 20" x 24" No. 25A Heald
GRINDER, SURFACE. 12" x 16" x 36" Mattison, Mag. chuck and rect., 1942
GRINDER, CUTTER. 30" Ingersoll, 1942
GRINDER, CARBIDE, Nos. 48 and 49 Excello
GRINDER, RADIUS, No. 49 Van Norman, late
GRINDER, TOOL & CUTTER. No. 2 Cincinnati
HOB SHARPENER. Type HRS Barber Colman
KELLER. BL2416 Pratt & Whitney 3 Spdl., 1941
LATHE, 16"x54" AMER. "PACEMAKER" 1941
LATHES, ENGINE. 13", 15" & 17" LeBlond
MILLER, AUTO 2-20 Kent Owens, 1942
MILLER, AUTO. 36" No. 33 Sundstrand
MILLER, DUPLEX, 4-48 CINCINNATI 1945
MILLERS. No. 10 & 3 VanNorman Duplex
MILLER, PLAIN. No. 2 Cincinnati HSDT, 1940
MILLER, PLAIN. No. 3H K & T MSDT 1943
MILLER, VERT. No. 2 B.&S. HSDT, 1943
MILLER. No. 36 VanNorman ram type, 1942
MILLING MACHINE, HORIZONTAL, No. 5H Kearney & Trecker, plain with Vert. Hd., 1941
PLANER. 66" Rockford hydr. openside 1941
SAW. 10" x 10" Racine Hydr., Hack., 1941
SHAPER. 6" P&W vert., also 12"
SHAPER. 16" Rockford hydr. univ. 1943
SLOTTER. 36" Rockford Hydraulic, 1942, excellent
TAPPER No. 10 Warner & Swasey, 1948
THREADER. 1½" HILL ACME LEAD SCREW '42

OVER 1,000 NEW AND USED MACHINE TOOLS IN STOCK
WRITE FOR LATEST STOCK LIST
MILES MACHINERY COMPANY
7039 EAST GENESEE • SAGINAW, MICH. PL. 7-3105

CIRCLE 501 READER SERVICE CARD

WORLD'S LARGEST STOCK
STAMPING PRESSES
SQUARING SHEARS • PRESS BRAKES
REBUILT *and* GUARANTEED
WILL LEASE WITH OPTION TO PURCHASE, OR WILL FINANCE OVER LONG TERM
JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
Philadelphia 34, Pa. Phone GArfield 3-8700

CIRCLE 502 READER SERVICE CARD

WANTED
MORRIS RADIAL DRILL
Heavy duty, newer than Serial J600, 11" column, 3½ ft to 4 ft arm.
RALPH STARK, INC.
43-12—33rd Street, Long Island City 1, New York

CIRCLE 503 READER SERVICE CARD

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

RADIAL DRILLS

4'-11" col. Morris Mor-Speed, m.d.
4'-11" col. Carlton, m.d.
4'-13" col. American Hole Wizard, m.d.
4'-15" col. Fosdick, 1944
4'-15" col. Cincinnati-Bickford, m.d.
6'-17" col. American Triple Purpose, m.d.
7'-16" col. American Triple Purpose, m.d.
8'-17" col. Dreses, gear box, m.d.
Baush Radial Drilling & Tapping Machine, m.d.

BALL BEARING DRILLS

No. 4 Fosdick, 8" overhang, m.d., H.S.
No. ½ Avey MA8, m.d.
No. 2 Avey, m.d.
No. 1B Edlund, m.d., new
No. 2B—8" H.D. Edlund, H.S., m.d.
No. 2LMS Leland & Gifford H.S., m.d.
No 2LMS Leland & Gifford, single spindle HS., m.d.
No. 4BM Fosdick, single spindle, HS., m.d.
No. 4MS Leland & Gifford H.S., 4 speed A.C. m.d. to spindle
1 spindle No. 2MA6 Avey H.S. Type B, m.d., 7½" overhang, 1943
2 spindle Atlas Bench Type, 1942
2 spindle Allen, belted m.d., 8" overhang
2 spindle No. 2 Avey H.S., belted m.d.
2 spindle No. 2BMA, 1 Avey Production Type, m.d.
2 spindle No. 3 MA6 Avey H.S., m.d.
2 spindle No. 2 Leland & Gifford H.S., 8" overhang, m.d.
2 spindle Leland-Gifford H.S. Hydraulic Type, m.d.
2 spindle No. 2 LMS Leland & Gifford, Hydraulic step by step H.S., m.d.
1 spindle No. 2 Avey, belted m.d.
3 spindle No. 3 Morse Taper, Foote-Burt "Sipp" H.S., m.d.
3 spindle No. 2B—8" Edlund, H.S., m.d.
3 spindle No. 2MA6 Avey, H.S., m.d.
3 spindle Leland-Gifford, 2 LMS—H.S., m.d., late
3 spindle Leland-Gifford H.S., m.d.
4 spindle Leland-Gifford, m.d., on each spindle
4 spindle No. 15 Buffalo Bench Type
4 spindle Allen H.S., belt drive
4 spindle No. ½ MA8 Avey, m.d., H.S.
4 spindle Demco H.S., individual m.d.
4 spindle No. 2MS Edlund, m.d.
4 spindle No. 2BMA6 Avey H.S., m.d.
5 spindle Allen H.S., belt drive
6 spindle Leland-Gifford, m.d. on each spindle, No. 2 taper
5 spindle No. 1 Avey High Speed, m.d.
6 spindle No. ½ Avey MA8 Avey, H.S., m.d.

HORIZONTAL DRILLS

2 spindle No. 410 W.F. & John Barnes, m.d.
Model 410 W.F. & John Barnes, Horizontal Boring & Drilling Machine, m.d.
No. 410 Barnes Single Spindle Deep Hole, m.d.
No. 2 Avey Style MA1, with horizontal operation
No. 1½Bx30" Model M1818 Pratt & Whitney 2 spindle Deep Hole, m.d.
No. 1½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, Model M1821, m.d., latest
No. 1½Bx105" Model M1825 Pratt & Whitney 2 spindle Gun Barrel Rifling, m.d.
No. 1 Model M500 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
Natco Horizontal Drill, 2 opposed B4F2 Head, 1943
3½"x40" Bausch Double Horizontal Drilling Machine, m.d.
No. 445 W.F. & John Barnes Independent 2 spindle Deep Hole Drilling & Boring Machine, late Model 2F1 Natco Horizontal Boring & Drilling Machine
No. 1Bx50" Model 1806 Pratt & Whitney 2 spindle Deep Hole

MULTIPLE SPINDLE DRILLS

2 spindle No. 6 Colburn Manufacturing Type H.D. separate m.d. to each spindle
3 spindle 28" Cincinnati-Bickford Upright Drill, m.d., No. 4 M.T.
4 spindle No. 201¼ Barnes H.D., m.d.
6 spindle Model M1613 Pratt & Whitney In Line Vertical Drill

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1-1241
CABLE ADDRESS EMCO

CIRCLE 504 READER SERVICE CARD

Mechanical Engineer

Desire graduate M.E. expert and experienced in tool design and manufacturing operations. Must enjoy flexible, creative work constantly facing him with the creative demands of new development and applications in material handling, tool design, and equipment utilizations. General supervisory and production experience desirable. Should be interested in keeping abreast of developments in modern metallurgy and advanced metal forming (stamping and fabrication) practices. Excellent opportunity for young man (28-35) now in $7,000-$9,000 range to grow rapidly through his basic contribution to a steadily expanding (non-auto) company in St. Louis.

All replies kept strictly confidential. Please address resumes to:

D. M. MORE
9827 Clayton Road
St. Louis 17, Missouri

CIRCLE 505 READER SERVICE CARD

JOBBERS WANTED

We manufacture Kob-Kleen (ground corn cobs) for deburring, burnishing, polishing and soft grit blasting of metals; metal stamping absorbents, etc. Nationally advertised.

COEVAL, INC.
Dept. D, St. Joseph, Illinois

CIRCLE 506 READER SERVICE CARD

An Investment!

Productive advertising is an INVESTMENT rather than an EXPENDITURE.

"Searchlight" advertisers almost invariably report prompt and satisfactory results.

BE CONVINCED — send us your advertisement TODAY.

Address
Classified
Advertising
Division

American Machinist
P. O. BOX 12
NEW YORK 36, N. Y.

AN INVESTMENT! Productive advertising is an INVESTMENT rather than an EXPENDITURE.
"Searchlight" advertisers almost invariably report prompt and satisfactory results.
BE CONVINCED — send us your advertisement TODAY. *Address Classified Advertising Division.*
AMERICAN MACHINIST, P. O. Box 12, New York 36, New York

MANUFACTURING OPPORTUNITY

Valuable United States and Canadian rights for sale or license on a household necessity. Article is for kitchen use and comprises an aluminum stamping. Only those with chain store or large mail order connections will be considered.

Box BO 1571, American Machinist
Class. Adv. Div.,
P.O. Box 12, N.Y. 36, N.Y.

CIRCLE 507 READER SERVICE CARD

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITION WANTED

Opportunity wanted to join a progressive company manufacturing commercial items where my 30 years experience in the following lines could be used to best advantage: Machinist, Master Mechanic, Toolmaker, Diemaker, Foreman, Designer, Estimator, and Supervisor. (Preferably Mass.) PW-1524, American Machinist.

WANT MORE INFORMATION on Searchlight Advertisements?

- Take advantage of a new service available on Classified advertisements to secure more information. Use the handy, prepaid reader service cards (at the end of the magazine) to bring you more data. The Reader Service number appearing under each advertisement need only be circled on the card.
- Use this time-saving service to keep abreast of the latest in used, rebuilt, surplus new equipment, employment or business opportunities.

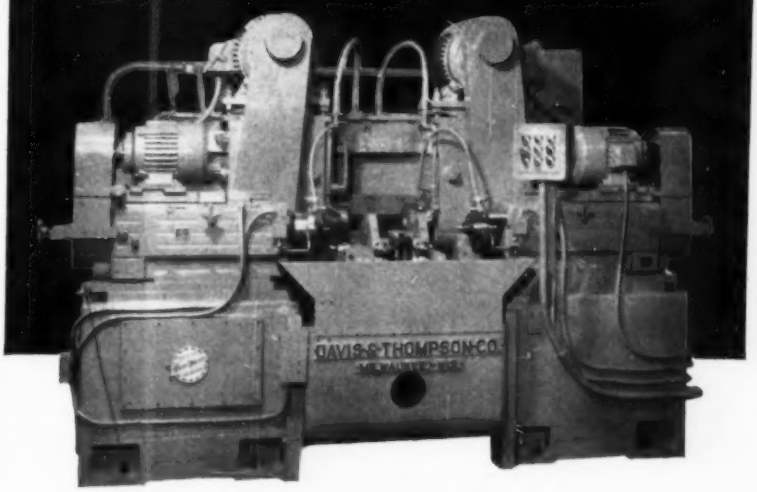
INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions

	Page
Abrasive Products, Inc.	181
Adamas Carbide Corp.	84
Airborne Instruments Laboratory	207
Allegheny Ludlum Steel Corp.	147
Almco Queen Products Div. King-Seeley Corp.	177
American Brass Co.	163
American Machinist	170-171
American Optical Co.	36
American Sealants Company	226
American Sip Corporation	30
American Smelting & Refining Co.	169
American Steel Foundries Elmes Engineering Division	41
American Tool Works Co.	83
Armstrong Blum Mfg. Co.	32
Armstrong Brothers Tool Compay	54
Atkins Saw Division Borg-Warner Corporation	164
Avey Division Motch & Merryweather Co.	20-21
Baker Bros., Inc.	149
Bardons & Oliver, Inc.	153
Barnes Drill Company	175
Bearings, Inc.	155
Behr-Manning Corporation	67, 68
Bellows Company Div. International Basic Economy Corp.	49
Besly-Welles Corp.	173
Bethlehem Steel Company	117
Bilgram Gear & Machine Company	178
Blake Co., Edward	200
Blanchard Machine Co.	224
Bliss Company, E. W.	50
Bodine Corp.	189
Boston Gear Works	185
Boye & Emmes Machine Tool Co.	214
Bridgeport Machines, Inc.	210
Brown & Sharpe Mfg. Co.	46-47, 65
Buck Tool Company	237
Bullard Co.	72
Butterfield Div. Union Twist Drill Co.	66

(Continued on page 236)

Basic Standard Machines *PLUS* D&T Engineering Will Give You More Profitable Production . . .



HERE'S WHY: Although this machine has been adapted to milling and centering of small shafts, its basic design lends itself to other operations through the addition of various types of heads as well as multiple spindle drill heads.

Feeds and speeds are variable. The hydraulically operated machine table is equipped with an air-operated fixture which is electrically controlled for either automatic or mechanical cycling.

If you need production with a minimum capital outlay, it will pay you to call in a D & T production engineer. There is no obligation for this service.

ADDITIONAL INFORMATION

For more examples of outstanding production machine tools, write for Bulletin 1002.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. . . . MILWAUKEE 10, WISCONSIN

CIRCLE 361 READER SERVICE CARD

RANDALL and STICKNEY Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

eter, balanced dial 0-25-0 with .0005" Model "C 50 B" has a 2½" overall diam- graduations, ½" range and movable dial easily set at zero.

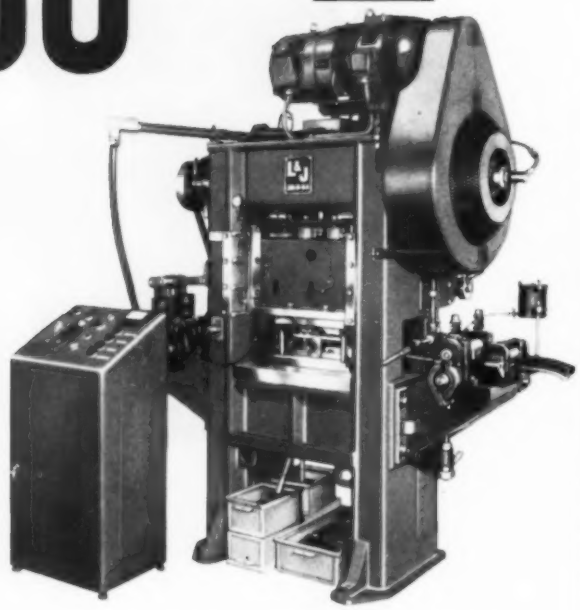
The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is an R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St
Waltham 54, Mass., U.S.A.
Makers of Dial Gages Since 1896

CIRCLE 362 READER SERVICE CARD

450 S.P.M. to keep production costs down



DOUBLE CRANK STRAIGHT SIDE PRESS

Here's new life for lagging production—speeds up to 450 strokes per minute to give you new highs in the output of small precision parts. Designed primarily for use with progressive dies this versatile 20-ton press gives you everything you need—speed—accuracy—big capacity—long die life—ease of set-up. It pays off in lower production costs.

L & J also manufactures other Straight Side Presses that efficiently handle wide ranges of press work, Single and Double Crank types up to 150 ton capacity . . . Gap Frame Presses from 30 to 75 ton . . . 23 OBI Presses, geared and non-geared, from 14 to 90 ton. *Write for complete information.*

L & J PRESS CORPORATION 1629 STERLING AVE. ELKHART, IND.

CIRCLE 363 READER SERVICE CARD

BIG CROWD

When a production man needs something—equipment, accessories, materials or supplies—he usually wants it in a hurry. The best place to find out "where to buy it" for Metalworking is the American Machinist Buyers' Guide.

The 1960 Buyers' Guide Issue of American Machinist—to be published in September, 1959—will include the biggest list of product sources ever. Over 3,400 manufacturers will list their products under 1,800 different headings. Meanwhile, when you need something refer to your 1959 Buyers' Guide. It's a tremendously valuable source.

INDEX TO ADVERTISERS

(Continued from page 235)

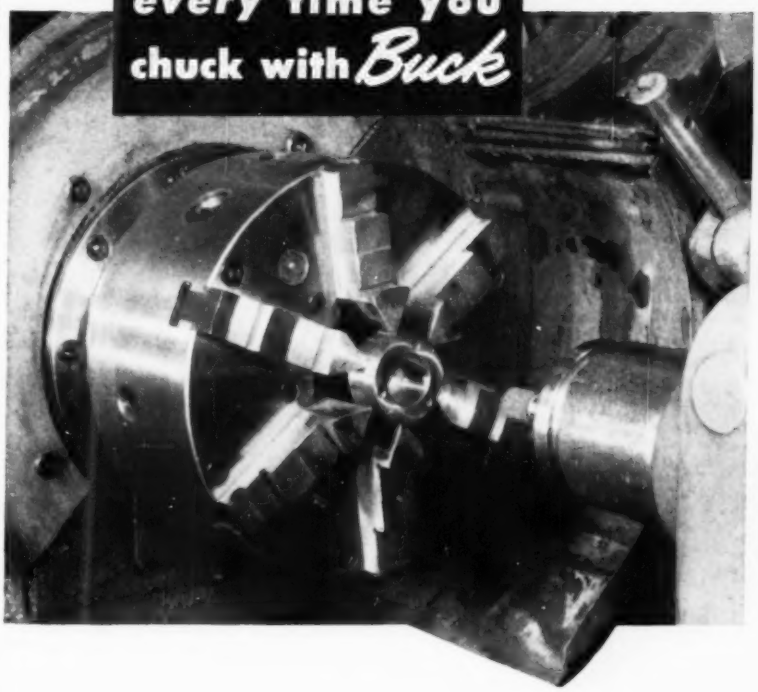
	Page
Chandler Tool Company	208
Chicago-Latrobe Company	80
Chicago Screw Co.	139
Cincinnati Gear Co.	188
Cincinnati Lathe & Tool Co.	55
Cincinnati Milling Machine Co. Grinding Machine Div.	5, 6-7
Cincinnati Shaper Company	22-23
Circular Tool Company	178
Cities Service Oil Co.	205
Cleveland Crane & Engineering Co.	218
Cleveland Grinding Machine Co.	214
Cleveland Instrument Co., Inc.	232
Columbus Die-Tool & Machine Co.	202
Commercial Filters Corporation	206
Crane Packing Co.	166
Cross Company	28-29
Dake Corporation	239
Danly Machine Specialties	48
Davis & Thompson Company	235
Delta Power Tool Division Rockwell Mfg. Co.	219
Dixie Bearings, Inc.	155
du Mont Corporation	62
Dunham Tool Co., Inc.	239
Eastern Express, Inc.	154
Elmes Engineering Div. American Steel Foundries	41
Engelberg, Inc.	174
Erickson Tool Company	137
Erie Foundry Company	213
Ex-Cell-O Corporation	86
Farval Corporation	76
Fawick Airflex Division Fawick Corporation	135
Fellows Gear Shaper Company	8-9
Gallmeyer & Livingston Co.	240
Gardner Machine Company	25
Gates Rubber Company	40
Gear Grinding Machine Co., Gear Grinder Div.	201
Geometric Horton	33
Gisholt Machine Company	51
Gleason Works	122
Gorton Machine Co., George	165
Goss & de Leeuw Machine Company	204
Grant Mfg. & Machine Comapny	238

INDEX TO ADVERTISERS

	Page
Greenfield Tap & Die Corporation	34
Greenlee Brothers & Company	74
Grob, Inc.	208
Hannifin Company Div. Parker-Hannifin Corp.	179
Hardinge Brothers, Inc.	53
Hartford Machine Screw Co.	139
Heald Machine Co. Sub. Cincinnati Milling Machine Co.	2nd Cover
Jahn Manufacturing Co., B.	196
Kearney & Trecker Corp.	217
Kennametal Inc.	194-195
Kerns Co., L. R.	230
L & J Press Corp.	236
Lamb Co., F. Joseph	141-146
Landis Machine Company	10-11
Landis Tool Company	12-13
LaPointe Machine Tool Company	26-27
Latrobe Steel Co.	197
Leland-Gifford Company	63
Linley Brothers Co.	222
Lodding, Inc.	176
Lodge & Shipley Company	24
Logan Engineering Co. Lathe Div.	212
Logansport Machine Company, Inc.	118
Lovejoy Tool Co., Inc.	198
Ludwigsburger Maschinenbau GMBH	159
Mattison Machine Works	211
McGill Mfg. Co.	209
McGraw-Hill Book Co., Inc.	230
Mechanite Metal Corp.	156-157
Micro Switch Div. Minneapolis Honeywell Regulator Co.	160-161
Mid-West Abrasive Company	168
Milford Rivet & Machine Co.	172
Minnesota Mining & Mfg. Co.	186-187
Mitts & Merrill	238
Modern Devices Sub. Twentieth Century Mfg. Co.	184

(Continued on page 238)

YOU make money every time you chuck with *Buck*



1. You get *dead true* precision chucking single parts—.0005" precision on duplicate parts. (Conventional chucks are only accurate to .003" *when new.*)

2. You save costly machinists' time. Takes but a minute to indicate and adjust a Buck. No fooling around with shims.

3. The Buck Ajust-Tru® principle helps compensate for spindle run-out, compensates for chuck wear—greatly lengthens chuck life.

Buck Ajust-Tru 3- and 6-jaw chucks cost no more than conventional chucks. Send for catalog—see for yourself why "It pays to chuck with Buck."

Makers of Scroll, Power, Dust Proof, Independent Chucks.

BUCK TOOL COMPANY

510 SCHIPPERS LANE • KALAMAZOO, MICH.

CIRCLE 365 READER SERVICE CARD

NEW IMPROVED FORMULA

SULFLO

LAYOUT LIQUID

CLEAR SMUDGE-PROOF LAYOUTS ON METAL WORK BY TOOL MAKERS, DIE MAKERS, MACHINISTS, ETC.

Order from your supplier—or generous trial size can shipped direct—$1 prepaid.

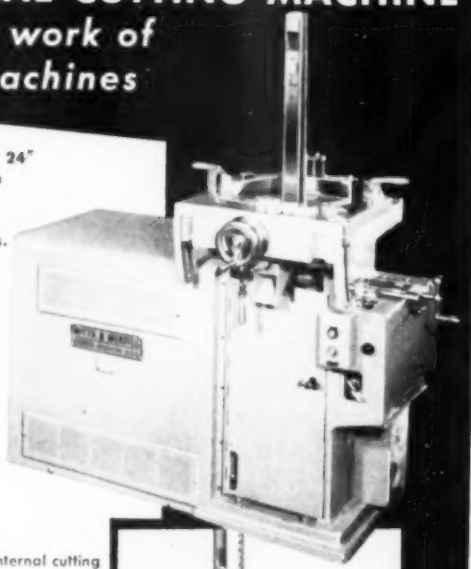
A PRODUCT OF SULFLO, INC. **ELIZABETH 4, N. J.**

CIRCLE 366 READER SERVICE CARD

AMAZING NEW HYDRAULIC **M&M** KEYSEATER AND VERTICAL CUTTING MACHINE

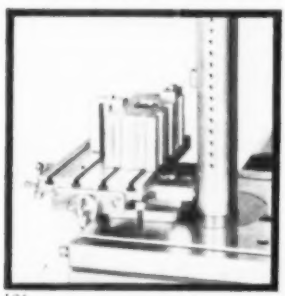
does the work of many machines

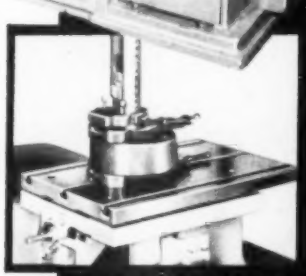
In addition to a keyseater that cuts internal keyways up to 3" wide x 24" long, the new hydraulic M & M is a handy tool room machine and can be easily adapted to special production jobs other than keyways. A wide variety of internal or external cuts, serrations, grooves and teeth can be rapidly made on this machine. With a combination tilting table and index table (shown on machine at right) straight or tapered bores and accurately spaced multiple keyways or splines may be cut at any degree of the circle. Send us prints of your cutting problems.



Right: Set-up for internal cutting

Below: Set-up for external cutting





BUILDERS OF MACHINERY SINCE 1854

106

M&M KEYSEATERS AND VERTICAL CUTTING MACHINES

MITTS & MERRILL • 104 Holden St. • SAGINAW, MICHIGAN

CIRCLE 367 READER SERVICE CARD

GRANT

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

85 Sillimas Ave., Bridgeport, Conn., U. S. A.

INDEX TO ADVERTISERS

(Continued from page 237)

	Page
Monarch Machine Tool Company	56-57
Morse Twist Drill & Machine Co.	14-15
National Acme Company	38-39
Nelco Carbide Tools	65
New Method Steel Stamps Inc.	200
Nicholson File Company	192
Nilson Machine Co., A. H.	167
Norgren Company, C. A.	225
Northfield Foundry & Machine Co.	208
Norton Company	18-19, 31, 37
O. K. Tool Company	227
Ohio Crankshaft Company	221
Ohio Department of Commerce	191
Ohio Seamless Tube Div. Copperweld Steel Co.	35
O'Neil Irwin Mfg. Co.	190
Parker-Hannifin Corp.	179
P I C Design Corp.	232
Pines Engineering Co., Inc.	229
Pittsburgh Plate Glass Company	214
Pratt & Whitney Co., Inc.	58-61
Radio Corporation of America Industrial Automation Equipment	172
Randall Co. Inc., Frank E.	235
Reid Brothers Co., Inc.	42-43
Rivett Lathe & Grinder, Inc.	199
Rockford Machine Tool Company	182-183
Roto-Finish Company	158
Rotor Tool Company	52
Ryerson & Son Inc., Joseph T.	78
Sheffield Corp. of Bendix Aviation	70
Sheldon Machine Company	222
Special Engineering Service Inc.	228
Standard Screw Co.	139
Starrett Co., L. S.	124
Steelweld Machinery Division Cleveland Crane & Engineering Co.	218
Stromberg Carlson Electronics Control Systems Div. General Dynamics Corp.	231
Sulflo Inc.	237
Sundstrand Machine Tool Company	44-45
Superior Hone Corp.	228

INDEX TO ADVERTISERS

	Page
Superior Steel Products Corp.	215
Surface Combustion Corp.	203
Tannewitz Works	239
Thompson Grinder Company	223
Threadwell Tap & Die Corp.	208, 228
Timken Roller Bearing Company Steel & Tube Div.	4th Cover
Turco Products Inc.	151
U. S. Tool Co. Inc.	3rd Cover
Universal Engineering Company	180
Van Keuren Company	64
Verson Allsteel Press Co.	216
Vinco Corporation	220
Vlier Engineering Corp. Sub. Barry Controls Inc.	120
Warner & Swasey Company	16-17
Wells Mfg. Co.	162
Western Automatic Machine Screw Co.	139
Whiton Machine Co.	226
Woodruff & Stokes, Inc.	222

American Machinist
ADVERTISING SALES STAFF

Atlanta 3 . . . W. O. Crank, 1301 Rhodes Haverty Bldg., Jackson 3-6951

Boston 16 . . . T. H. King, J. H. Koch, 350 Park Square Bldg., Hubbard 2-7160

Chicago 11 . . . W. J. Haring, Bayard Nicholas, 520 N. Michigan Ave., Mohawk 4-5800

Cincinnati 8 . . . R. H. Anderson, Gifford W. Plume, Jr., 2637 Erie Ave., East 1-6110

Cleveland 13 . . . William E. Surgner, 1165 Illuminating Bldg., 55 Public Square, Superior 1-7000

Dallas 1 . . . Robert T. Wood, 901 Vaughn Bldg., 1712 Commerce St., Riverside 7-5117

Denver 2 . . . John W. Patten, Mile High Center, 1740 Broadway, Alpine 5-2981

Detroit 26 . . . W. J. Reichard, 856 Penobscot Bldg., Woodward 2-1793

Los Angeles 17 . . . Robert Obenour, 1125 West Sixth St., Huntley 2-5450

New York 36 . . . D. G. Sawyer, Paul F. Cowie, 500 Fifth Ave., Oxford 5-5959

Philadelphia 3 . . . J. P. Tiebout, 6 Penn Center Plaza, Locust 8-4330

Pittsburgh 22 . . . K. Reeves Cook, 1111 Oliver Bldg., Express 1-1314

St. Louis 8 . . . Bayard Nicholas, 3615 Olive St., Continental Bldg., Jefferson 5-4867

San Francisco 4 . . . R. C. Alcorn, 68 Post St., Douglas 2-4600

Europe . . . E. E. Schirmer, McGraw-Hill House, 95 Farringdon St., London E.C. 4. Michael R. Zeynel, 85, Westendstrasse, Frankfurt/Main, Germany

TANNEWITZ

VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 FPM. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.

The TANNEWITZ WORKS Grand Rapids, Michigan

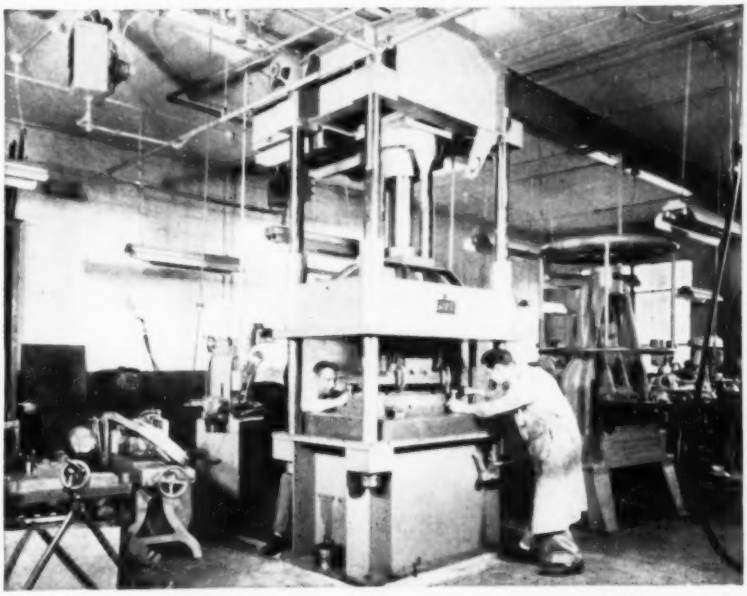
CIRCLE 369 READER SERVICE CARD

NEW EXPANDING COLLET pat. pend.

Inside chucking to .0005 T.I.R.
5C, 4C, 3C, 3AT, J sizes in stock.
Sizes from 3/16" to 6" dia.
Order 5C size complete $15.95.
Machinable from 1 5/8" to 3 3/8" dia.

THE DUNHAM TOOL CO., INC., Danbury 4, Conn.

CIRCLE 370 READER SERVICE CARD



The diemaker who made a nuisance of himself

This is the story of Three Star Manufacturing Co.—a custom diemaker who serves a number of manufacturing plants in Chicago.

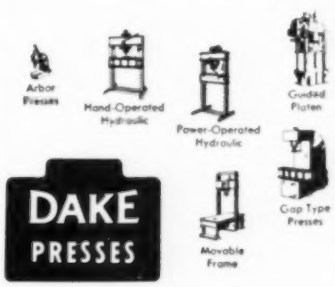
As in most such shops, his only means of trying out dies was a hand power screw press which sometimes needed six or seven men to get the needed pressure.

Large dies had to be tried out on his customers' production presses . . . which required drayage ($15 to $20 each way) and interruption of his customers' production. It meant both expense and nuisance to his customers and himself every time a die had to be tested.

Now he has ended the nuisance by installing the press shown above in his own shop. It not only saves time and money, but avoids the embarrassment of having workers in his customers' plants see and know that occasionally a die must be taken back for adjustment.

Specifications for DAKE single-acting and double-acting die tryout presses in eighteen electrically operated models are contained in Bulletin 350A. Write today for your copy!

DAKE CORPORATION, 636 Robbins Road, Grand Haven, Mich.



Send for Big New Catalog

DAKE CORPORATION
636 Robbins Road, Grand Haven, Mich.
Please send me a copy of Dake Bulletin 350A

Name _____
Company _____
Address _____
City _____ Zone ____ State ____

CIRCLE 371 READER SERVICE CARD

NEW *from* GRAND RAPIDS

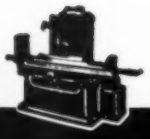
No. 350 PRECISION TOOL ROOM TYPE HYDRAULIC FEED SURFACE GRINDER

and just look at all these features:

- Powered vertical movement of wheel head*
- Instantly variable hydraulic table speed
- Greased-for-life precision ball bearing spindle with two speeds for long wheel life
- Head carried on protected pre-loaded ball bearing ways
- Equipped with Vickers vane type pump and our own control valve for infinite longitudinal table speeds from 5" to 120' per minute
- Variable speeds hydraulic cross feed and continuous cross feed
- Rugged, one-piece casting column and base for permanent rigid alignment
- Ultimate in accuracy with micro inch finish at production speeds

**Automatic downfeed available as optional feature*

For full details, just send a note on your letterhead.



GALLMEYER & LIVINGSTON

GALLMEYER & LIVINGSTON CO.
430 Straight Ave., S.W., Grand Rapids, Mich.

more

metalworking facts

free

from

American Machinist

These handy, prepaid cards will bring you more data on:

- **PRODUCTS ADVERTISED**
- **NEW EQUIPMENT DESCRIBED**

also

- **COPIES OF CATALOGS OFFERED**

now

EVERY ADVERTISEMENT,* NEW EQUIPMENT ITEM, AND CATALOG OFFERED IN THIS ISSUE IS NUMBERED

* *A few advertisements cannot be keyed and must be indicated by writing the Advertiser's name at the bottom of the card.*

• *for full details on how to use these cards, see reverse side . . .*

First Class Permit No. 64 (Sec. 34.9 P.L.&R.) New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp necessary if mailed in the United States

5c Postage will be paid by—

American Machinist

330 West 42nd Street

New York 36, N. Y.

This card expires 7/4 59

5/4/59

Reader Service Dept.

First Class Permit No. 64 (Sec. 34.9 P.L.&R.) New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp necessary if mailed in the United States

5c Postage will be paid by—

American Machinist

330 West 42nd Street

New York 36, N. Y.

This card expires 7/4/59

5/4/59

Reader Service Dept.

(These are KEY numbers, not page numbers)

1	23	45	67	89	111	133	155	177	199	221	243	265	287	309	331	353	375	397	419	441
2	24	46	68	90	112	134	156	178	200	222	244	266	288	310	332	354	376	398	420	442
3	25	47	69	91	113	135	157	179	201	223	245	267	289	311	333	355	377	399	421	443
4	26	48	70	92	114	136	158	180	202	224	246	268	290	312	334	356	378	400	422	444
5	27	49	71	93	115	137	159	181	203	225	247	269	291	313	335	357	379	401	423	445
6	28	50	72	94	116	138	160	182	204	226	248	270	292	314	336	358	380	402	424	446
7	29	51	73	95	117	139	161	183	205	227	249	271	293	315	337	359	381	403	425	447
8	30	52	74	96	118	140	162	184	206	228	250	272	294	316	338	360	382	404	426	448
9	31	53	75	97	119	141	163	185	207	229	251	273	295	317	339	361	383	405	427	449
10	32	54	76	98	120	142	164	186	208	230	252	274	296	318	340	362	384	406	428	450
11	33	55	77	99	121	143	165	187	209	231	253	275	297	319	341	363	385	407	429	451
12	34	56	78	100	122	144	166	188	210	232	254	276	298	320	342	364	386	408	430	452
13	35	57	79	101	123	145	167	189	211	233	255	277	299	321	343	365	387	409	431	453
14	36	58	80	102	124	146	168	190	212	234	256	278	300	322	344	366	388	410	432	454
15	37	59	81	103	125	147	169	191	213	235	257	279	301	323	345	367	389	411	433	455
16	38	60	82	104	126	148	170	192	214	236	258	280	302	324	346	368	390	412	434	456
17	39	61	83	105	127	149	171	193	215	237	259	281	303	325	347	369	391	413	435	457
18	40	62	84	106	128	150	172	194	216	238	260	282	304	326	348	370	392	414	436	458
19	41	63	85	107	129	151	173	195	217	239	261	283	305	327	349	371	393	415	437	459
20	42	64	86	108	130	152	174	196	218	240	262	284	306	328	350	372	394	416	438	460
21	43	65	87	109	131	153	175	197	219	241	263	285	307	329	351	373	395	417	439	461
22	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	418	440	462

INSIDE FRONT COVER — INSIDE BACK COVER — BACK COVER

UNKEYED AD

Name _____

Title _____

Company Name _____

Address _____

City, State _____

SEARCHLIGHT SECTION

Samples	Used and Rebuilt Equipment		
500	507	514	521	528
501	508	515	522	529
502	509	516	523	530
503	510	517	524	531
504	511	518	525	532
505	512	519	526	533
506	513	520	527	534

(These are KEY numbers, not page numbers)

INSIDE FRONT COVER — INSIDE BACK COVER — BACK COVER

UNKEYED AD

Name _____

Title _____

Company Name _____

Address _____

City, State _____

SEARCHLIGHT SECTION

Samples — Used and Rebuilt Equipment

500 507 514 521 528
501 508 515 522 529
502 509 516 523 530
503 510 517 524 531
504 511 518 525 532
505 512 519 526 533
506 513 520 527 534

more data?

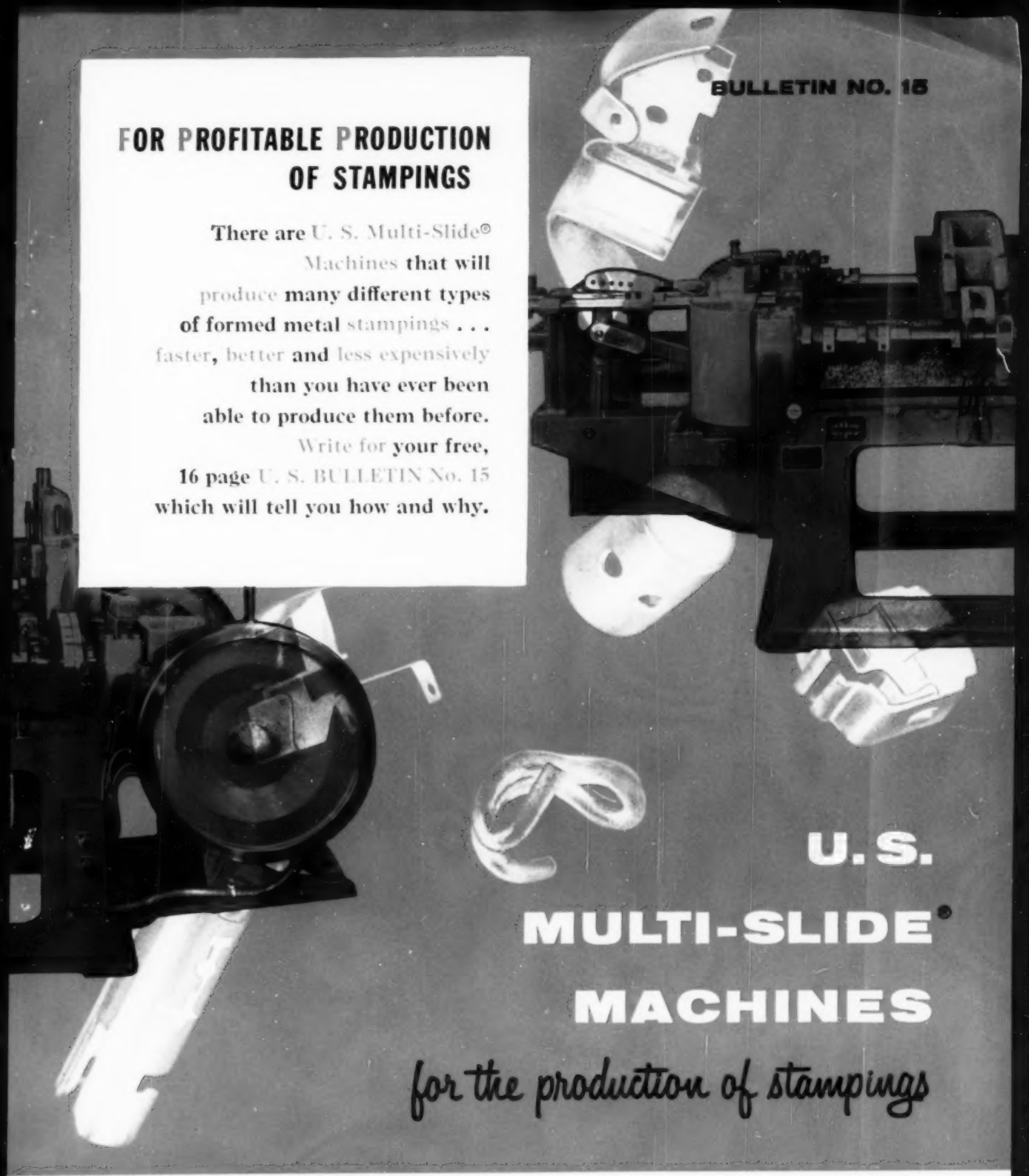
it's easy

1. Circle Key Number(s)
on these cards that
correspond(s) to number(s)
at bottom of advertisement(s),
new equipment item(s)
or catalog(s) offered

2. Print clearly . . .
name, title, company name and address

3. Tear Off and Mail . . .
We'll do the rest

Use these time-saving cards to keep up-to-date with the metalworking industry



BULLETIN NO. 15

FOR PROFITABLE PRODUCTION OF STAMPINGS

There are U. S. Multi-Slide® Machines that will produce many different types of formed metal stampings . . . faster, better and less expensively than you have ever been able to produce them before. Write for your free, 16 page U. S. BULLETIN No. 15 which will tell you how and why.

U. S. MULTI-SLIDE® MACHINES

for the production of stampings

US PRODUCTS

U. S. TOOL COMPANY, INC.

AMPERE 1 (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

It actually costs less to get uniform forged quality like this

THIS is an actual unretouched photo of rock bit forgings made from Timken® forging bars steel. It costs less to get this uniform forged quality when the steel is uniform. And Timken steel doesn't vary in structure, chemistry or dimension from heat to heat, bar to bar, order to order. You don't have to interrupt to make costly adjustments when you forge with Timken steel.

We take *extra* quality control steps to make Timken electric furnace fine alloy steel as uniform a steel as you can buy. For example, the Timken Company was the first U.S. steel maker to use the magnetic stirrer to keep molten alloys equally distributed, work slag constantly and keep temperature uniform. Ours was the first direct-reading spectrometer to insure exact composition down to the instant the furnace is tapped. What's more, The Timken Company's unique method of handling orders individually enables us to target procedures to meet your end-use requirement.

Why not insure a better forged product and save money doing it? Specify Timken fine alloy steel—the steel that's uniform! The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

WHEN YOU BUY TIMKEN STEEL YOU GET:

1. Quality that's uniform from heat to heat, bar to bar, order to order
2. Service from the experts in specialty steels
3. Over 40 years experience in solving tough steel problems

TIMKEN® *Fine Alloy* STEEL